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December 1956

Agriculture

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Lodging in Cereals. This survey of recent technical investigations is by J. B. A. Rodger, Experimental Officer of the East Scotland College of Agriculture. It refers particularly to the influence of plant nutrients and light intensity.

Farm Management Studies. Two years ago a number of Hampshire farmers began a group approach to the study of farm management. P. S. Boyer of the N.A.A.S. describes the method adopted and refers to findings made on dairy farm productivity.

Grazing Systems. Dudley E. Eyles, of the Grassland Research Institute, Hurley, describes various grazing systems for animal production, laying special emphasis on the production of high starch-equivalent value per lb. of dry matter to meet the requirements of fattening sheep.

Problems of Land Reclamation No. 3. Malcolm J. A. Jenkins, of the N.A.A.S., describes the heathland reclamation on Lord Iveagh's Elvedon Estate in the Suffolk Breckland. Reclaimed cropped land on this estate now extends to 9,500 acres.

Poultry Meat Production in Britain. The problems are examined by Dr. R. Coles, especially in relation to consumer demands and the prospects of increasing sales.

These are only some of the important articles in the December issue. There are also the regular monthly features — book reviews, conference reports, etc., and a comprehensive economic review prepared by the Economist Intelligence Unit. The December Agricultural Review is now on sale.

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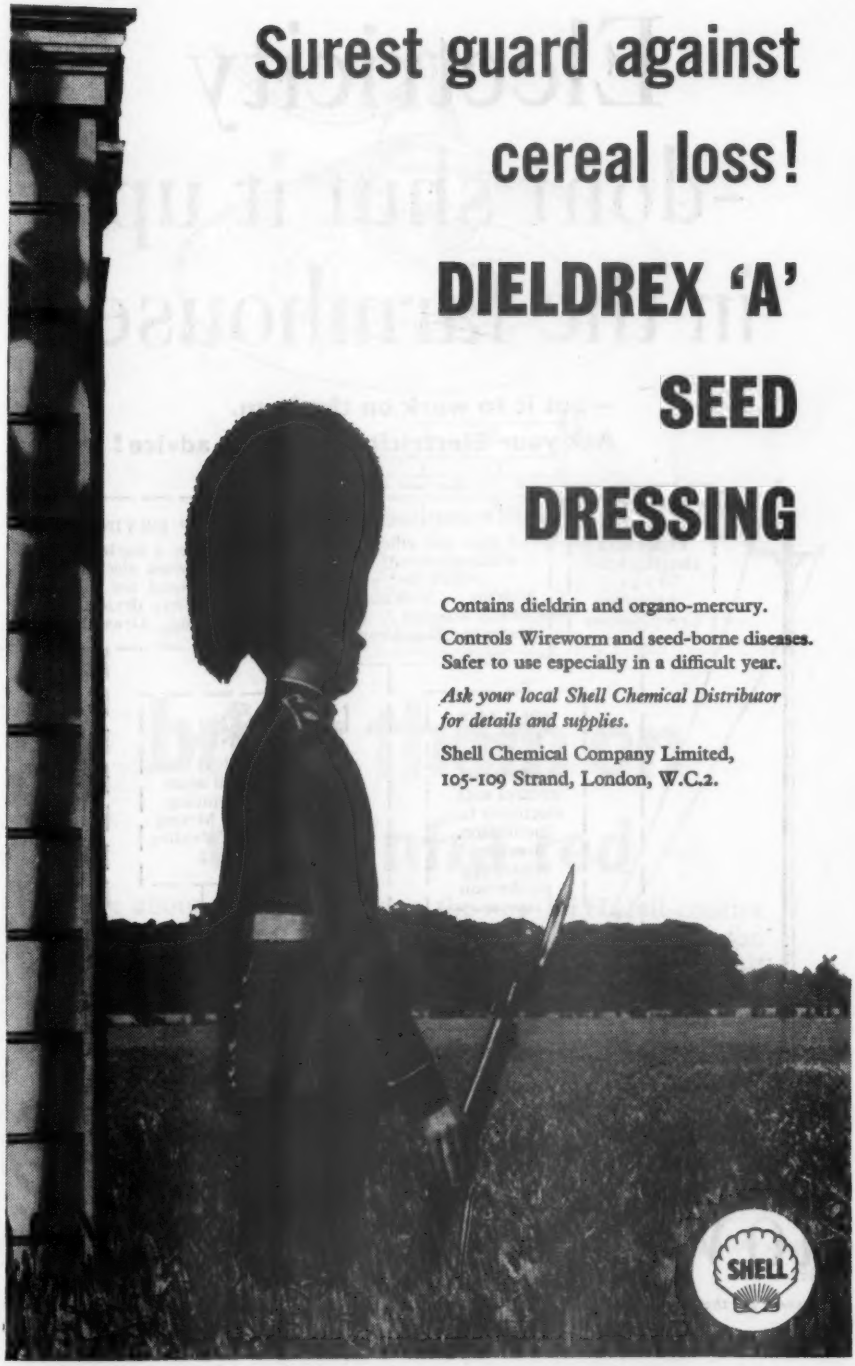

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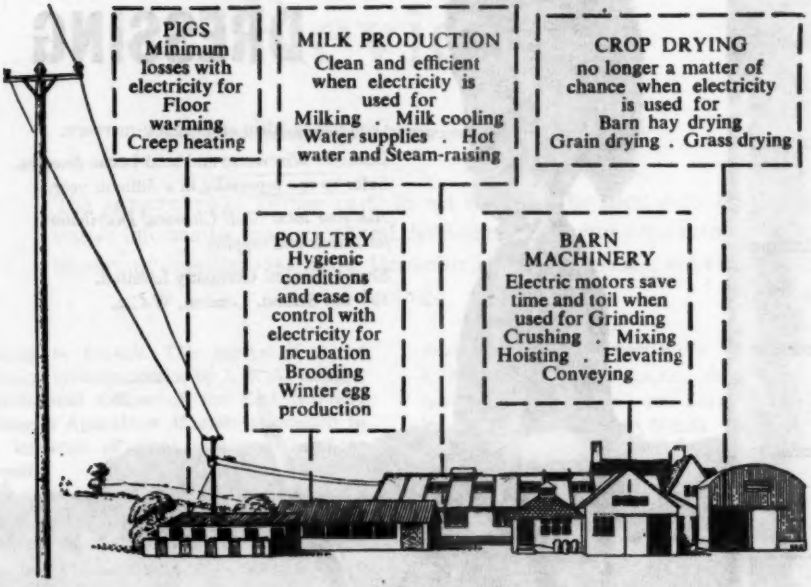
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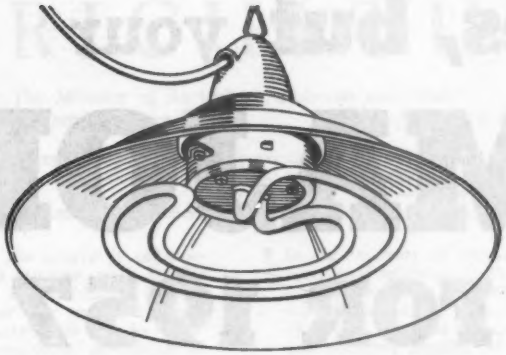

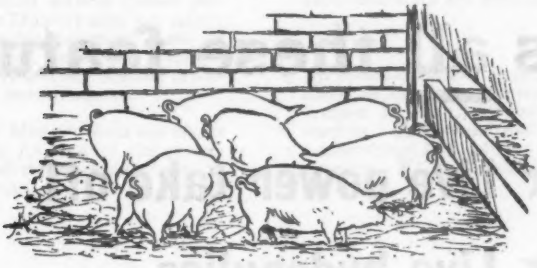

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AGRICULTURE

VOL. LXIII No. 9 DECEMBER 1956

TRADITIONAL FARMING PAYS

FRANK H. GARNER

Cambridge

Mr. A. W. Goleby, farming 148 acres at Bedingfield, Suffolk, obtains crop yields 50 per cent above the N.A.A.S. Eastern Province average. The three points of his programme are sound tradition, wise planning and good management.

LOOKING over someone else's fence is always an interesting, and often a profitable, pastime. And if your leisure time happens to occur when you are in East Anglia, there can be few better fences to look over than those of Mr. A. W. Goleby at Green Farm, Bedingfield, nr. Eye in Suffolk. For during the last five years he has won, in the Suffolk Agricultural Association Farms Annual Competition, the first prize three times and second prize twice for the best Suffolk farm in the 100-300 acre group. Also, records show that the crop yields obtained on this 148-acre farm are 50 per cent above the average for the Ministry's Eastern Province. Bearing in mind the very high standard of arable farming in East Anglia, this is indeed something worth talking about.

How has this high level of farming been achieved? It can hardly be attributed to natural advantages, for the soil at Bedingfield is typical of a fairly large area round about, known locally as tender, heavy land. In old farming language, it is best described as two to three horse land. Drainage is essential; without it, cropping could not succeed. There is, in fact, no single answer to this question. Put simply, it is the result of wise planning and good management by the farmer.

A Happy Christmas

AND

A Prosperous New Year

to all our readers

High All-Round Manuring When he started farming, Mr. Goleby was anxious to be sure his manuring programme was right, so he had every field on his farm analysed by the Advisory Chemist. His subsequent policy has been based on the recommendations of the chemist, supplemented by the advice of the District Advisory Officer. As a result, liberal dressings of farmyard manure have been given to roots and beans (at least a quarter of the arable land receives farmyard manure each year), and complete fertilizer to beans, roots and, usually, cereals as well. It is particularly interesting to note that in conjunction with this high, all-round manuring, Mr. Goleby has been making a regular practice of putting 4 cwt per acre of sulphate of ammonia on his winter wheats and 1½ cwt per acre on the spring barleys. For sugar beet, he applied this year 4 cwt salt per acre (in future this will be reduced to 2 cwt), in addition to 10 tons farmyard manure and 7 cwt complete fertilizer per acre. A nitrogenous dressing was applied to the seedbed at the rate of 2 cwt per acre. This is, unquestionably, high farming, for no arable field on the farm escapes some manure in a season.

The farm cropping is based on the traditional Norfolk four-course rotation—roots, barley, seeds, wheat. There are about 30 acres of each crop. The roots grown have invariably been sugar beet; the barley variety has been changed from time to time, but in 1956 it was entirely Proctor. The seeds section of the rotation has been rather variable and has included broad red clover (for hay and seed), winter beans, spring beans, beans for canning, and peas for canning (including Harrison's Glory and Lincoln Blues). Spring and winter wheat complete the rotation, the winter wheat now being entirely Cappelle. Long leys are put down for the pigs, but these are not included in the real rotation farming.

It will be noticed that the varieties that have been selected for both winter wheat and spring barley are those that will stand liberal dressings with nitrogenous manures without lodging. Undoubtedly the combination of the right manuring and the right varieties has had much to do with the good yields that have been obtained, but it would be wrong to assume that such yields can be achieved solely by manuring and the use of certain varieties. The management of the crops must also be first class.

Timely Operations A glance at the times of drillings shown in the farm records indicates something of the careful planning on this holding. All the sugar beet is drilled in March, singling is done in good time, and the crop is ready for harvesting at just the right time. Indeed, the sugar beet crop is a good example of the timeliness of the whole of the cultivations. Ploughing for all the spring-sown crops is completed before Christmas to make the best use of weather and allow ample opportunity for some of the weeds to germinate and be killed before the drilling takes place. It is quite obvious that this planning of cultivations has played a very big part in the efficiency of the cropping of the farm.

Before leaving the crops, some details must be given of the yields obtained. The average yield of all Cappelle wheat in 1955 was 80 bushels per acre, and in 1956 this was raised to 82 bushels per acre. In 1955 Herta barley gave 92 bushels per acre, and Proctor 85 bushels, but with the difficult harvest this year the yield of Proctor fell to 72 bushels. The yields from spring bean crops has been outstandingly good, averaging nearly 40 bushels per acre, while pea yields have not fallen far short of this figure, even in 1956. Sugar beet is an important crop on the farm, the four-year average to 1955 being 17.1 tons of washed roots with 17.6 per cent sugar content.

Livestock and Poultry Turning to the livestock side, there are really two main enterprises, which also serve the secondary purpose of helping to build up the fertility of the farm. First, there is a pig breeding unit of Essex and Large Whites, which has an output of some 250 pork pigs for slaughter each year. This is augmented by a certain amount of winter fattening of beef cattle in yards. These beef animals are fed very largely on by-products, including dried sugar beet pulp.

Another project which is contributing handsomely to the income is the poultry unit, which has been steadily enlarged and modernized during the last three years. It consists of two distinct sides—table poultry and eggs.

The table poultry unit, which runs continuously for 10 months, produces every week 400 spring chickens, averaging 3¾ lb live weight at eleven weeks. The birds are reared throughout in wire-floored cages and are split between three houses according to age. They are fed on table poultry crumbs and are debeaked at ten days to prevent feather-picking. A caponizing tablet is implanted when they are moved to the fattening cages at 7-8 weeks old.

The pullets in the egg production unit used to be kept in 400 cages and two deep-litter houses, but they are now housed in 400 old-type, single-bird cages and a new four-tier 1,000-bird cage unit. All replacement pullets are reared in outdoor brooders and rearing houses, receiving farm-ground and -mixed mashes from eight weeks onwards.

The changeover to all-battery production was not due to lack of success with the deep-litter units, but was mainly brought about by the fact that the 1,000-bird cage would go into one of the houses, thus leaving the other available for the expanding pig unit.

The livestock enterprises fit in with the arable cropping since, at certain times of the year, they can make available extra labour to assist with some of the harvesting and, possibly, the hoeing of sugar beet. But, on the whole, the livestock side is kept to itself.

The examination of an enterprise such as this tends naturally to be rather an impersonal business. But sooner or later the farmer must come into the reckoning, for he is, after all, the pivot on whose strength the whole enterprise depends. Apart from the basic planning, to which reference has already been made, Mr. Goleby lives on the farm, takes a keen interest in the whole of the work, and works with his men the whole time—a fine example of the value of a farmer's personal contact.

Better Management—Lower Costs

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of the

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on

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BREEDING RHODE ISLAND REDS AND LIGHT SUSSEX

GERALD SCOTT

Little Hallingbury, Bishop's Stortford, Herts

Mr. Scott has won a high reputation as a breeder of pedigree Rhode Island Red and Light Sussex poultry, and his hens have had numerous successes in national laying trials. His methods of breeding and rearing at Little Bursteads will be of undoubted interest to many poultry farmers.

THE primary aim at Little Bursteads can be expressed quite simply. It is to assist in maintaining the Rhode Island Red and Light Sussex breeds in their premier position, and, by combining old-time stockmanship with modern concepts of good breeding, to improve their health, stamina and productivity.

Some 20 acres of good pasture are devoted to the poultry, and are stocked with about 800 hens and 1,200 pullets. The houses vary in capacity from 45 to 150 birds, and each has alternate runs of adequate size. No intensive methods are used. The chicks are reared in outdoor brooders and have access to grass from one day old. If the weather is very severe they may be kept in for a few days, but never after they are a week old. This early contact with grass teaches the chicks to graze, whereas intensively reared birds rarely acquire the habit. When chicks are reared by a hen, they are subjected to alternate heat and cold, which makes them hardy and stimulates quick feathering. The type of brooder we use imitates the hen and warms the backs of the chicks. I am not in favour of warm-floor brooders. Adult birds have never been allowed near the chicks' rearing ground—a rule that Professor Hutt has shown to be correct in view of the risk of exposure to lymphomatosis, to which young birds are particularly susceptible.

All replacement stock is individually bred and wingbanded to hens in the special pens. There are ten special pens of R.I.R. and three of L.S., each with 13 or 14 hens to a male bird. A few of these pens are headed by second-season cocks, but most are headed by cockerels.

All pullets hatched between February 1 and March 14 are trapnested for seven days a week. Eggs are weighed on very accurate scales and weights recorded for 48 weeks, according to the following scale:

Special Grade—2¼ oz and over
First Grade —2 oz and over
Second Grade—1¾ oz and over

This has been done continuously since 1934.

Selection of Breeding Stock Chicks are retained only from dams giving a minimum of 70 per cent of good chicks from eggs set. Usually the figure is between 75 and 80 per cent. Until 1948, only the best looking pullets were housed for trapnesting, after passing a critical inspection for type, size and colour. Probably only seven of a group of twelve full sisters would pass this inspection, and the remainder were sold. Perhaps these seven pullets would average 250 eggs in 48 weeks, in which case the family was looked upon as valuable, regardless of the fact that the five birds disposed of may have been poor producers. However, in 1948 Professor Lerner came over from California and gave the poultry breeders of this country a jolt. He insisted that each family should be kept complete,

unselected and unculled, and that its egg production should be expressed as a hen-housed average.

Professor Lerner's method is expensive, in view of the fact that many poor producers must be kept for 48 weeks at a cost of approximately £2 each. Also, there is the added danger of a few unthrifty birds causing an outbreak of disease. Nevertheless, it was decided to give his ideas a trial for three years. The trial has, in fact, now run for seven, with the following results:

Year	48 Weeks Hen-housed Average	Percentage Alive at End of 48 weeks	Percentage Deaths and Culls
1948-49	187	94.89	5.11
1949-50	201.2	96.12	3.88
1950-51	218.74	92.06	7.94
1951-52	177.12	80.53	19.47
1952-53	206.77	90.46	9.54
1953-54	206.12	91.63	8.37
1954-55	213.09	95.25	4.75

The figures for 1951-52 were influenced by heavy mortality in a section of the flock which had been hatched in February and set aside until the birds to be sent to laying trials had been selected. The deaths occurred suddenly; usually the pullets collapsed whilst being handled in the course of trap-nesting. Carcasses were sent both to Weybridge and Houghton for examination, and it was obvious from their findings that the trouble was nutritional and had no relation to breeding. But it meant that a year's work had been completely wasted and that all the figures obtained in that year were totally unreliable. It was decided to ignore them and to pin our faith in the back breeding of the parent stock.

An example of what this year's upset meant can be quoted. A favourite hen had been repeat-mated by a certain cock in 1951, and the results of the same mating over the two years are tabulated below:

	Daughters of Hen	Deaths and Culls	Hen-housed Average	Daughters of Cock	Deaths and Culls	Hen-housed Average
1950	9	—	234	30	1	241.3
1951	12	8	148.1	43	17	161

It is interesting to note that a 1951-hatched stock cockerel from this mating was sold to a well-known pedigree breeder. Obviously he was pleased with the performance of the bird, for in 1953 three of his five special pens of Rhode Island Reds were headed by sons of this cockerel. Since then, the breeder has maintained his place in the forefront of the laying tests, and, in fact, has won the highest honours.

If additional evidence of sound health is required, it can be mentioned that between 1953 and 1955, 109 pullets were sent from Little Bursteads to official laying tests. and of this number only two failed to survive the 48 weeks of the test.

Judgment of the Individual Continuing the story of selecting breeding stock, the method is as follows. Those families which have achieved a hen-housed average of 200 eggs are set aside as potential breeders, and within these families all birds with an individual record of 200 eggs of good size, shape and texture become candidates for the special pens. From this point onwards, it is a matter of judgment to select the best. Selection pressure is increased by competition from older hens for places in the breeding pens. Some of these older hens will have been progeny-tested and proved to be good breeders. The points stressed are good bone, balance, head and eye, quality, feather and colour.

It is easier to demonstrate than to describe what is meant by quality. Professor Lerner has pointed out that if too many factors are selected for, little or no progress will be made. Doubtless this is true, but it should be remembered that good type and reasonably good colour still have a sales value, not only in this country but in many places abroad. The question can be posed whether it is worth breeding for a very high average egg production if the flock breaks down in health. It can be argued that if the flock is more profitable, despite high mortality, then it is justified. But what of the future? Might not this high rate of mortality be progressive, until the point is reached when the increased rate of production is no longer economic?

Good bone is important. Birds which lay extremely heavily tend to draw upon their reserves in the bone, especially if they are under-nourished at any time. Those birds with good bone are less likely to break down in health than others with small refined bone. Correct bone structure, especially a long straight keel, is not just a fancier's fetish, but an essential framework to carry the weight of the internal organs of a heavy layer, thereby reducing the risk of prolapsus. Good-boned birds have strong, deep and rather short beaks. Birds with flat backs, square shoulders and straight sides are usually the best layers, especially when their feathers are strong, broad and tight.

Small birds can be bred to lay large eggs, but in consequence there is a risk of a host of ovarian and other troubles. On the other hand, coarseness is usually associated with excessively large birds. Therefore, it is better to breed for medium size.

Mating Up The stock males are selected on phenotype from the soundest families on paper. They cannot excel in every respect, and the birds chosen are those with no obvious weaknesses, rather like the all-rounder who is so valuable in a cricket team. Certainly, they will not lack vigour or reasonable breed characteristics.

The hens which have been so carefully selected, first on family performance and then as individuals, are allotted one by one to the most suitable male. There is no slavish adherence to a rule; each case is considered and judgment formed on it. The guiding principle is to mate slight weakness in any particular factor to extra strength. Full sisters will be grouped together as far as possible, but some families may be split. Thus given eight full sisters, of which four are really good bodied and four are lacking in depth, the policy would be to mate the latter to a different and more suitable male. The same applies when some of the sisters lay too large an egg, and others too small. An additional advantage of splitting a good family, to quote a not inappropriate saying, is that the breeder avoids the risk of having all his eggs in the same basket.

Heritability of egg size is high, and it is suggested that size of egg follows that of the sire's dam. We therefore take great care when mating up to ensure that the pullet progeny will lay eggs of reasonable size. Whilst the laying tests demand a 2-oz egg as the minimum to score after the first eight weeks, and most breeders aim at producing eggs of 2¼ oz, the Packing Station standard egg is only 1⅞ oz minimum. I think it is high time this standard was revised, both in the interest of the housewife and the pedigree breeding industry.

Selection is made for brown glossy eggs of good shape. It is thought that glossy eggs are associated with vitality, and there is no doubt about the British public's preference for brown eggs.

Many systems of breeding appear to attach chief importance to the sire. At Little Bursteads the emphasis is always placed on the dam. For example,

Hen No. 990 was hatched in 1949 and was used in the special pens for five seasons, each year with a different cockerel. Her hatchability results were as follows:

Year	Mated by Cockerel No.	Eggs Set	Infertile	Good Chicks
1951	2001	51	1	46
1952	26	37	—	36
1953	36	45	2	38
1954	33	47	—	47
1955	51	15	1	12
		195	4	179=91.8 per cent of eggs set

It is interesting to note that this hen was five years old before she reached her prime. In 1954, every egg set gave a good chick. Furthermore, the unselected pullets from these chicks which were retained on the farm produced a hen-housed average of 234 eggs in 48 weeks.

It has already been mentioned that all the unselected pullets hatched in 1954 gave a hen-housed average of 213.09, and it may be of interest to give the relative figures for the progeny of each sire. In round numbers, and in the order of the ten special pens, they were: 220, 200, 233, 229, 217, 227, 188, 196, 205, 219. It will be seen that there is no significant variation, and the same has been true year after year.

The reader will have gathered that there has been no dogmatic adherence to any recognized system of breeding. Mild in-breeding has been tried on a few occasions, but it is possible that much better results would have been obtained by out-crossing. The flock has been closed for periods of five or six years, then an out-cross to one of the pens has been introduced, mainly to supply new blood to regular customers.

Disappointments and Compensation Difficulties and disappointments in poultry breeding are many, and the rate of progress is slow. One of the difficulties is an economic one, for pedigree breeding is not remunerative even at the best of times. Now, with the country divided into two areas for such a long period under the Fowl Pest Regulations, it is quite uneconomic. Practically every inquiry for stock cockerels comes from the area to which adult birds cannot be sent. This is because it has always been customary for breeders buying new stock to send to the opposite end of the country for it.

But against this there is at least some compensation in the satisfaction and obvious appreciation of customers. Particularly gratifying at this time is the interest shown by overseas buyers: stock has already been exported to 29 countries. This, of course, is the final test of the supplier's methods, for the breeder who conscientiously progeny tests, even if he cannot supply the superlative, can at least protect his customers from buying poor stock.

IMMERSION CLEANING OF MILKING MACHINES

C. C. THIEL, B.Sc., PH.D.

National Institute for Research in Dairying, Reading

Immersion cleaning for direct-to-can milking equipment, as developed by the N.I.R.D., is a quick and effective routine which does away with all the usual scrubbing and steaming.

CONSTANT economic pressure for more effective use of manpower on farms has created a demand for labour-saving methods and devices. Dairy farming has already seen the milking machine replace hand-milking, and it may be expected that milking direct-to-can will, as the opportunity arises, replace the more laborious system of bucket milking in cowsheds. Not least of the advantages of direct-to-can milking in conjunction with in-can cooling is the elimination of some equipment. And of all the jobs associated with routine milking of cows, the least welcome is cleaning and sterilizing the milking equipment, so that any system which uses fewer components has obvious attractions in this respect.

During the last few years a group of people at the N.I.R.D. have been trying to carry the simplification of cleaning a stage further. The components of the direct-to-can milking machine coming into contact with milk have been reduced to the bare minimum for effective milking, and, moreover, each of these items has been redesigned where necessary to fit in with a simplified cleaning system. Trials extending over the last three years have shown that these few simple components can be kept clean without scrubbing merely by immersing them for the whole time between milkings in a caustic soda solution which also contains a chemical to prevent scale deposit. The milking equipment is packed into a special basket so that it can be put into and taken out of the caustic solution with safety, and the articles are so arranged in the basket that air-locking is avoided and all surfaces come into contact with the cleaning solution. Caustic soda in solution is a powerful bactericide and performs the dual functions of cleaning and sterilizing.

Fewer Components The photograph on page iv of the art inset shows clearly how few milk-contact components are required for one complete direct-to-can milking unit. Metal parts are of stainless steel, to withstand constant immersion in caustic soda. Not all present-day clusters are suitable for immersion cleaning, an essential feature for this purpose being that the liners can be readily freed within the shell. The reason for this is that caustic soda solution is always able to find its way behind the liner, and the only safe procedure seems to be to open the pulsation chambers to allow free access of both the caustic solution and the subsequent rinsing water. Since the liners have to be released from the shells twice a day, it is prudent to choose a pattern of teat-cup assembly which allows this to be done easily and quickly. We have used both one-piece moulded liners and two-piece liners made up from extruded liners and milk stems. Both of these are readily released, and to keep the mouth of the liner clear of the shell, special lugs are moulded on the stems.

The milking lid shown in the photograph consists of a plain disc of stainless steel with two tubes, the vertical for the stall tube and the inclined one for the milk tube. Incoming milk is thus directed against the wall of the

can and churning does not then occur. The gasket is loosely held by three studs so that cleaning solution and rinsing water can circulate freely.

In keeping the surfaces as plain as possible, with a view to ease of cleaning, several components of normal milking equipment have been omitted—namely, a milk strainer, a shut-off cock in the milk tube from the claw to the lid, and a moisture trap in the vacuum line from the lid. In direct-to-can milking the strainer serves no useful purpose, except to show the presence of clots resulting from mastitis infections. If the milk from a number of cows is being bulked at milking time, a strip-cup must be used before milking to achieve this end. A cock in the milk line is used in parlour milking to shut off air-flow through the cluster at the beginning of milking, when removing the cluster from a cow or in a minor emergency. Using the simplified equipment, the long milk tube may be kinked to help remove the cluster from a cow's teats, and for use at the beginning of milking and in an emergency, a special peg is provided on the stall so that the claw-piece may be hung with the cups in the cut-off position. A cock is also used sometimes when clusters are dipped in disinfectant between milking one cow and the next as a mastitis control measure. But the value of this practice is not well established and it is certainly not universally followed. We have therefore not provided for it.

The moisture trap is a component of doubtful value and has been omitted. As a precaution against contamination from the stall tube due to condensate forming in it and running back into the can, this tube is also cleaned by immersion.

Cleaning is Simple The top photograph on page iv shows two units packed into a basket with a mesh floor, the whole having been lowered into the immersion cleaning tank. The operations with this equipment are simple. Just before milking the basket is carefully lifted clear of the solution and lodged on the rim of the immersion tank to drain. While this is taking place, about 5 gallons of water are run into the rinse trough and ½ oz of approved hypochlorite is added. The basket is then placed on the floor and the components transferred to the trough. Some users prefer to hose the basket and contents before the transfer so as to avoid contact with caustic soda solution. The long tubes are now taken from the basket in a bundle and, while retaining them as a bundle, the ends are butted one at a time to the tap. Thus in a few seconds all the bores are rinsed free from caustic soda. The rest of the gear is then rinsed in the trough. Unless most of the caustic soda is removed, there will be difficulty with slipping rubber. The units are then made up one at a time and placed on cans ready for milking.

A small working surface placed adjacent to the trough, measuring, say, 2 feet × 1½ feet and covered with a sheet of rubber ⅛-inch thick, is adequate for assembling the equipment. The rubber is wetted with trough water containing hypochlorite to keep it clean.

After milking, all the gear is returned to the rinse trough, which still contains the original water. The long tubes are detached, rinsed at the tap, and placed one by one in the basket. The lowest tube rests on an ascending wire spiral and the others lie on it. The tubes are retained by pegs. Next, the liners are released from the teat cups, the shells being kept clear of the liners by lugs on the milk stems. The clusters are then placed on the bridge in the basket with the lids to the sides. Small components such as claw bungs are placed loose in the bottom. The basket is large enough to hold three sets of equipment if required, the third lid resting on the mesh floor beneath the clusters. The basket and contents are then lowered, taking care to avoid splashing, into the immersion tank and the lid is replaced.

Monthly Check At the end of every month the milking components must be completely dismantled and inspected. Any faulty rubberware is replaced and such routine operations as cutting and reversing liners are carried out. If slippery films of soap can be felt in the liners, they should be removed by brushing in warm water. The solution in the tank must be renewed at monthly intervals. The old solution is run to waste, and the tank half-filled with water to which 3 lb flake caustic soda is added and dissolved by immediate stirring for 1-2 minutes. A stick about 2½ feet long enables the operator to keep well clear of the caustic soda solution. Then 4 oz EDTA (ethylene diamine tetra-acetic acid) should be stirred in to prevent lime deposits occurring, either from hardness in the water or calcium in the milk. The quantity of the additive may vary according to district; in soft-water areas 2 oz would suffice, but with very hard water 6 oz may be necessary to keep the equipment free from scale.

The basket is next placed in the tank and more water added until the level is about 2 inches below the tops of the handles. With reasonable care in removing the basket from the immersion tank, and taking care to ensure that the shells are back over the lugs, loss of liquid from the tank is small. There should thus be no need for topping up.

The strength of the caustic soda solution is not critical, but about 2 per cent seems best. Some caustic soda is used up in taking the EDTA into solution, and with 3 lb caustic soda and 12 gallons of water, the final caustic alkalinity is slightly over 2 per cent.

A Few Drawbacks The greatest single disadvantage of immersion cleaning is that the technique is not applicable to existing milking machines. Not only is it necessary that all metal parts should be of stainless steel, but the components need to be of special design. On the other hand, simplification of the equipment to assist cleaning would be worth while no matter what cleaning method is used.

A further limitation of the system is that full advantage can only be taken with direct-to-can milking equipment. Large items such as machine milking pails could not readily be accommodated in a basket small enough to be lifted easily out of the immersion tank. It might be worth while cleaning the clusters, long tubes and pail lids of bucket units by immersion, and the buckets themselves (which in any case are fairly easy to clean) by some other method such as a hot detergent-hypochlorite scrub. A suitable pail lid could be designed without any great difficulty.

Some people have criticized the technique on the score that caustic soda is dangerous to handle. The danger is probably more apparent than real. Accidental contact with 2 per cent solution is unlikely to cause damage to the skin if rinsed off immediately. Splashes in the eyes are, however, painful and dangerous. Instant bathing with copious quantities of water is the only remedy likely to be available and effective.

Easier and Cheaper Experience with immersion cleaning on ten commercial farms for three years has shown that milk of very good bacteriological quality can be produced consistently with equipment cleaned in this way. The farmers concerned have in most cases made considerable savings both in labour and running costs. The cost of chemicals, excluding hypochlorite in the rinsing water, is about 8*s*. a month, and hot water is required only to take the chill off the rinsing water for comfort. Hot water is, of course, needed when the equipment is completely dismantled at the end of the month, and on most farms some brushing is necessary on this occasion to remove visible accumulations of residues.

IMMERSION CLEANING OF MILKING MACHINES

From the worker's point of view, immersion cleaning is attractive, because the job is simple and straightforward and takes little time. Getting a two-unit machine ready for milking and returning the equipment to the immersion solution can be done comfortably in 10 minutes at each milking. More than one milker has mentioned the advantage of no longer having his hands softened by the hot-detergent scrub.

Constant immersion in 2 per cent caustic solution has a useful de-fatting action on rubberware. Stretched liners show little loss of tension in the four weeks between cuttings, so that milking efficiency remains constant. Most farmers who co-operated in the development work of immersion cleaning reported a useful increase in liner life. But undoubtedly the greatest advantages of immersion cleaning are its certainty and simplicity.

THE MINISTRY'S PUBLICATIONS

Since the list printed in the September 1956 issue of AGRICULTURE (p. 279), the undermentioned publications have been issued.

MAJOR PUBLICATIONS *Copies are obtainable at the prices quoted from Government Bookshops or through any bookseller.*

Bulletins

No. 37 Silage (*Revised May 1956*) 3s. (3s. 2d. by post)

Other Publications

Domestic Food Consumption and Expenditure: 1954 Annual Report of the National Food Survey Committee (*New August 1956*) 5s. (5s. 2d. by post)

Smallholdings Organized on the Basis of Centralized Services: Land Settlement Association Annual Report, 1954-55 (*New September 1956*) 2s. (2s. 2d. by post)

LEAFLETS *Up to six single copies of Advisory and Animal Health Leaflets may be obtained free on application to the Ministry (Publications), Soho Square, London, W.1. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (4½d. by post) and 2d. (3½d. by post) respectively.*

Advisory Leaflets

No. 46 Docks and Sorrels (*New August 1956*)
No. 244 The Rook (*Revised September 1956*)
No. 403 Fodder Beet: Feeding Value and Practice (*Revised August 1956*)
No. 452 Wild Oats (*New September 1956*)
No. 455 Wheat (*New July 1956*)

Animal Health Leaflets

No. 13 Salmonella Infection in Poultry (*Revised August 1956*)
No. 17 Mastitis in Cattle (*Revised September 1956*)

Fixed Equipment of the Farm

No. 28 Procedure for Building and Other Work on Farms and Estates (*New August 1956*) 8d. (10d. by post)

FREE ISSUES *Obtainable only from the Ministry (Publications), Soho Square, London, W.1.*

Miscellaneous Leaflets

Bulk Storage of Tractor Fuel (*New August 1956*)
Facts about Milk (*New June 1956*)
S.19 Versus Contagious Abortion (*New June 1956*)
The Marginal Production Scheme (*Revised August 1956*)
Technical Note 5. Improvement of Hill and Marginal Land in Wales (*New September 1956*)

NEW CRAFTS FOR OLD

LAURENCE EASTERBROOK, O.B.E.

Encouraged and helped by the Rural Industries Bureau, village craftsmen throughout England and Wales are learning and applying new skills to meet the needs of modern rural communities.

MENTION the phrase "village craftsman" or, still worse, "rural craftsman" to the average Englishman and nine times out of ten he will visualize an olde worlde, dilettante survival from the times of William Morris; a man who produces outdated trivialities to sell to an arty-crafty market that likes to give Christmas presents "all made by hand". Once I congratulated a farmer on having such a good local craftsman to fulfil his needs. He looked at me in astonishment.

"Whoever do you mean?" he asked. "I didn't know we had one."

"But you have," I replied. "You were telling me only the other day how he made a spare for your combine in two hours and saved you a week's delay."

"Oh, you mean Sid," was his reply. "But he's not a craftsman; he's our village handyman."

Sid, incidentally, had not only passed with flying colours through a course in arc-welding organized by the Rural Industries Bureau, but could have taken the whole of my friend's combine-harvester to pieces and put it together again. He mends anything from tractors to perambulators, and in his spare time designed and made a pair of wrought-iron gates for a university that compare with the best work at any time in the history of this craft.

Rural Engineers The village craftsman has moved with the times and is an indispensable member in the countryside. Machinery may have made farming less dependent on the weather, but it has also made it dependent on machinery, and that means on the men who look after it and repair it. When a dozen horse teams gathered the harvest, a mishap to one was not a major calamity. When the same work is done by a couple of combine-harvesters, a broken sprocket brings half the harvest to a standstill and a speedy repair is absolutely essential. That is just where the local craftsman who is on the spot, has a power-equipped workshop and has attended courses both in welding and in the upkeep and repair of combine-harvesters, comes into his own and is invaluable. Nor is it merely his technical knowledge for which we farmers are grateful. Living in the village and brought up on the land, he is part of farming and understands the urgency of it all, so that he will happily work all night at times of peak activity on the farm to have the machine going first thing next morning. So often, too, one finds that the craftsman in iron, brought up with it all his life and probably descended from a long line of smiths, has a feeling and understanding of the metal that is not always found in the average garage mechanic, and indeed which we have no right to expect an ordinary mechanic to have.

It was not always like this. The village blacksmith was slow off the mark when the tractors came. He let the trade slide away to the garages, while he lamented the passing of the horse. It was not until the Rural Industries Bureau, formed in 1921, began to educate, lead and inspire country craftsmanship, that the blacksmith came to realize that although he had lost for good most of the old trade in shoeing, the iron horses that had come to the land needed even more attention. We do not call them blacksmiths any

longer; they are "rural engineers", and the Rural Industries Bureau has found it difficult to keep up with their thirst for new knowledge. In the past year the Bureau held twenty-four courses of instruction for them, thirteen dealing with combine-harvesters and pick-up balers, three with binders, four with tractor hydraulic systems and four with electrical equipment. There has also been individual instruction in gas and arc welding, centre lathe turning and basic smithing, totalling 2,116 visits. Seldom has money been better invested than when the Development Commissioners thirty-five years ago decided that rural craftsmanship, far from being outdated, had still a vital part to play in modern rural life and must be encouraged.

The Artistry of Wrought Iron Side by side with this entirely practical work has developed an ability to produce decorative wrought iron, often of the highest artistic merit. There is no doubt that art is well served when the practical and the aesthetic are found in harmony in the same man at the same forge. There are, of course, exceptions. The public taste in such matters is often appalling and most people are blissfully ignorant of the principles of craftsmanship in iron. So when a second-rate performer produces some shoddy fire-screen with a ghastly sprig of tin holly pinned on to it, all too true to life down to the last vein in every leaf, there is usually some wretch at hand to buy at once this revolting counterfeit, "*so* cheap, my dear, and so *exactly* like a piece of holly". Not only is the perpetrator thus encouraged in his bad ways, but better smiths than he are tempted to make easy money by accepting such false standards. The Bureau has done much in this respect to promote quality in design by producing a wide range of blue-prints which are free on application by any craftsman who wishes to make something that is both practically and aesthetically satisfying.

Workers in Wood No less important to country life than the man who works in metal is he who works in wood. Electric power has revolutionized things for him because it brings power to the smallest workshop on an economical basis. We sometimes regret the modern trend for centralizing industry on an enormous scale, turning skilled men into mere numbers on a pay-roll, but here is a case where progress has put power into the hands of the individual and enabled him to remain *an individual* competing successfully with the large concerns. A progressive farm seems to be for ever wanting new gates, more pig and poultry huts, new trailers, repairs to buildings and cottages, painting, glazing and all manner of odd jobs. Happy the farmer or estate owner who can call upon one in the village who is a craftsman in wood and has the same feeling for it as the smith for iron, who takes a personal pride in his work, and does not compute his profit by doubling the wages of his employees and adding a bit more for luck. Such men are in growing request, and there can hardly be a sizeable village in England where there is not room for one.

The R.I.B. has helped them in the same kind of way as it has helped the craftsmen in iron, preparing lay-outs for up-to-date workshops and advancing loans for their equipment. Boat-building has seen a marked development in recent years by these small concerns, some of which are adding their quota to the export drive, using modern techniques of lamination and the resin glues to meet very rigid specifications. The Bureau's Boatbuilding Officer is available for advisory visits and technical guidance.

Resin glues and lamination for producing bent shapes are affecting design in furniture as well as methods of production, and here again many of the woodworkers are finding time to produce modern furniture of the highest

standards for a select but growing market that is weary of the anonymity of mass production. Such men are not quaint survivals of another age when there was no alternative to handwork. They use power and modern processes where such things are useful to them, and they are abreast of the latest developments. Some of them are among the most live members of the village communities in which they live, and they are meeting and beating factory methods in their particular sphere by the excellence and individuality of their work, which in some cases can undersell the factory product.

English Saddlery Workers in iron and wood are not, of course, the only craftsmen in our villages. There are the saddlers who have built up a reputation for English saddlery that is unrivalled in Europe or America. Consequently, there is a consistent though modest demand from overseas. There are difficulties, however. The saddler is no longer in such daily local demand as the worker in iron or wood. So while some saddlers who have developed markets for leather work are having to turn away orders, others have too little to do. This makes the recruitment of apprentices, which is fundamental to the trade, not easy to organize; for it is a four-year apprenticeship and boys want to be assured of the prospects before embarking upon it. There are instances where the familiar "vicious circle" is in sight, with firms refusing orders and curtailing their activities for lack of trained men while recruits for apprenticeship hold back because the future is uncertain.

New Ideas in Thatching The thatching of roofs of houses and farm buildings is another country trade in which the Bureau has been able to give assistance. We all know the centuries-old type of thatching with straw laid along the roof so that the stalks shed the water. Many of us also know the extremely attractive Norfolk reed thatching. But there is a third method, found chiefly in the West Country, by which a machine on the threshing drum strips the ears and flag from the wheat straw without it going through the drum. This "combed" straw, as it is called, gives a result more like Norfolk reed thatching than the usual straw thatching. It is also very durable, since the heads and more perishable part of the straw are removed. The Bureau has been encouraging its use, and the long straw thatchers are usually pleased to make the change, especially now that long-stalked threshing straw of good quality is becoming increasingly difficult to obtain. The Bureau also looks like having designed successfully a new machine for cutting reed at a very high speed and laying it in even swaths for easy collection.

Machines the Servant, not Master How different, then, is the overall picture from that of the arty-crafty hobbyist who obstinately turns his back upon machinery just because he wants to do it "all by hand". We see instead a whole series of specialized industries that use machines and in some cases are inventing entirely new ones, while remaining their master instead of their servant. Modern farming would face a catastrophe if this local skill and service ceased to be available; they are integral parts of the most primary of man's activities—that of growing his food. For good measure many of them are enriching our environment with objects of high artistic merit. They are artists whose hand and eye have been trained through long hours of practical work, who learned long ago that the rough usage of farm life demands standards of construction and design that would leave the producer of shoddy stuff bankrupt in a few years.

It is impossible that such discipline should not be reflected in character or that so much original work should not breed individuality. Machinery,

after all, cannot produce original work; it can only give us the results of other processes. Besides giving invaluable service, therefore, and work that shines like a beacon of civilization in an over-mechanized world, the rural industries are breeding a race of men which our age least of all can afford to be without; a leaven for the national character that is far more important than its size would at first suggest.

The Rural Industries Bureau Annual Report for 1955-56, *Hand and Machine in the Country*, can be obtained through any bookseller, or direct from the Bureau at 35 Camp Road, Wimbledon Common, London, S.W.19, price 1*s.* 6*d.*

N.A.A.S. Experimental Husbandry Farms

BOXWORTH

E. T. SYKES, M.A.
Farm Director

CUCKOO Pastures Farm, Boxworth, is an 849-acre clayland farm midway between Cambridge and Huntingdon and with an average rainfall of 22 inches. It has a history of arable farming and was heavily cropped with corn from 1940 to 1948, but like many of the heavy clay farms of west Cambridgeshire and Huntingdonshire, the farm was virtually out of cultivation during the period of depressed farm prices between the two world wars.

The Ministry became the occupier of the farm at Michaelmas 1948. There were then three sets of farm buildings, each with semi-covered cattle yards, a barn, some loose boxes and stables. A grain drier had been installed in 1944 but there were no storage silos. All the buildings have been retained, but the decision to establish a dairy herd required the erection of new covered yards for 66 cows with milking parlour and loose boxes. An implement shed, fertilizer store, workshop, grain silos and two Dutch barns have also been built, and some of the open cattle yards have been roofed. The four cottages that were on the farm are likely to be condemned, and they have already been replaced by new ones. Twelve more cottages have been built, so that the number of workers can be maintained at about twenty-five.

The Farming System Most of the farm is boulder clay, with a few acres of Kimmeridge Clay and Ampthill Clay. All three clays are difficult to work, are low in phosphate but contain sufficient free chalk to make liming unnecessary. The subsoil is impermeable but mole-drains well, and the whole farm is mole-drained over tile drains. Crawler tractors are essential if cultivations are to be carried out at the right time, and they are used for ploughing, cultivating, heavy harrowing and combine drilling.

Although Boxworth is in a mainly arable area, grass has had to be introduced to provide keep for cattle and sheep. Grass and lucerne leys total 350-400 acres, but are not being taken all round the farm, because some 200 acres of it would be expensive to fence and supply with water. The lucerne and lucerne-grass leys do well on the clay, giving three heavy cuts a year, and they are cheap to grow, since little fertilizer is needed after the

first year. However, strip grazing of these leys is impossible during wet periods, because the land quickly poaches. This naturally restricts the general usefulness of the lucerne: otherwise, the present acreage of 75 would certainly be increased.

At present, the leys are being left down for at least six years to help suppress wild oats, but once this weed has been reduced they will be ploughed after three or four years. Six years may well be regarded as too long to lay a field away to grass, even to deal with wild oats; for if there is no dairy herd, output from the field suffers. Intensive cropping can, however, be resumed after such a long rest, and the first four crops at Boxworth after the long leys are winter wheat (two years), potatoes, winter wheat—crops which can give a high cash return.

Wheat is, of course, the main cash crop, and just under 200 acres are grown every year. One-third of the wheat is spring-sown. Although the ploughing of long leys has only just started and most of the wheat is on all-arable fields, yields are high. An average 39 cwt per acre was sold in 1955, and 33 cwt per acre in 1954. Potatoes, beans, threshed peas, and broad red clover form the main breaks in the cereal rotation, and two of these crops, or one of them with oats—for example, oats-peas or oats-red clover—are used to provide a two-year rest from wheat and barley before sowing once again to winter wheat.

Fertilizers are used liberally to obtain high yields. The policy with phosphate is to give every crop some rather than to rely on the residual from previous heavy dressings. Grass (but not lucerne) gets some phosphate every autumn. The response of cereals and grass to potash is small, and so this fertilizer is used only on roots, beans, peas, and lucerne in its first year.

The livestock comprise a non-pedigree Friesian herd of about 70 cows, from which all calves are reared, and a ewe flock. Calves and store cattle are bought to supplement home-bred animals for experimental work, and about 300 cattle are kept on the farm throughout the year. All are dehorned and have to be yarded during the winter because the grass poaches so easily. However, an attempt is to be made this year to outwinter store cattle on lucerne and grass sown in wide rows.

The flock of 320 Scotch Half-bred, Welsh Half-bred and Suffolk Half-bred breeding ewes is kept entirely on grass. Pigs had to be given up some years ago but will be reintroduced shortly.

Dealing with Wild Oats One of the first tasks on entering the farm was to reduce the very heavy infestation of wild oats. Most of these weeds are of the spring-germinating kind, and it is now quite clear that the surest way of clearing a field is to lay it away to grass or lucerne for about eight years and to follow with one, or even two, crops of winter wheat. Obviously during this period there must be no fresh contamination—for example, by carting out barn sweepings or farmyard manure direct from cowshed or yard. After six years in grass, only 20-30 wild oat plants per acre have appeared in the first winter wheat crop—a number that makes roguing practicable. An experiment here showed the danger of ploughing out sooner. After three years in ley, 8 wild oat plants per square yard were counted in the spring, but by leaving the wild oat seeds undisturbed under the ley for a further two years, the number capable of germinating when the land was worked down in the spring fell to just over 1½ to the square yard.

On the arable side, the wild oat fallow was brought in to deal with the worst infested fields. This type of fallow is the opposite of the traditional

heavy land fallow, where the idea is to bake the clods in the summer sun. Instead, a fine tilth is worked down in the spring and worked again at intervals into the summer, causing the wild oat seeds to germinate early and be killed by the subsequent cultivations. A second cleaning crop, such as potatoes or arable silage, following the fallow has dealt with more wild oats. Almost as good results were obtained without a fallow by growing spring-sown arable silage followed by potatoes. Two years of this kind of cropping has not cleared wild oats completely but it has brought the infestation down to a level where, if only labour had been available, the weeds could have been hand-rogued very cheaply.

A method which is also proving successful and does not involve fallows or root crops, is to delay the drilling of spring wheat and barley until the second half of April; that is, 4-6 weeks later than usual. The land is pulled down in the spring as soon as it is fit to work, causing wild oat seeds to germinate before the corn is drilled. In a good spring, two crops of germinating wild oats have been killed, but in a very dry spring the method is not always so effective. The corn yields have not suffered because of the later sowing, and for Atle wheat grown after winter wheat on fields clear of wild oats we have had up to 30 cwt per acre from late April drillings.

Wild oats are still to be seen at Boxworth but a combination of the methods described above, allied to good cultivations and a few precautions, such as making sure that seed corn is free of wild oat seeds, and not carting farmyard manure from the cowsheds and yards to the field without first heaping it, has reduced them to reasonable numbers.

Crop Experiments Seventy-seven acres are given over to crop experiments and include long- and short-term trials concerned with the problems of the heavy clay soils of East Anglia. From the results obtained so far, depth of ploughing has had little effect on the yields of wheat, barley or potatoes, though the yield of sugar beet has been raised by ploughing every other year at 15 inches. It may be that winter frosts followed by good spring cultivations can mask the effects of ploughing depth for cereals and potatoes.

In a long-term experiment comparing rotations containing leys, the improvement in soil structure after a three-year lucerne ley is very marked and is clearly superior to the effect of a three-year grass-clover ley. Yields of the arable crops after the leys follow the same trend, but farmyard manure has had little effect where fertilizing is adequate. This result is borne out elsewhere on the farm, where high yields are being obtained on fields that have not seen farmyard manure or a long ley for at least fifteen years. Another experiment involving the ploughing-in of straw four years in every six is beginning to show some increase in yields, but it is too early yet to say whether there is any improvement in soil structure.

In the shorter-term experiments in progress wide rows (24 inches) are proving superior to corn rows for spring beans, and a seed rate of two bushels per acre has resulted in a marked loss in yield over the more usual three bushels. Response of spring beans to farmyard manure and fertilizers has so far been small.

A seed rate of 2½-3 bushels per acre has been found to be the best for early or late sowing of spring-sown Atle wheat, both with light and heavy dressings of nitrogen. A new series of trials have been started to see which, if any, of the modern varieties of spring wheat and barley are particularly unsuited to late April drilling—an important point where late sowing is contemplated to combat wild oats.

Experiments with Stock Husk, or parasitic bronchitis, is rare in the cattle on the farm, possibly because the pastures are clear of cattle during the winter and there are sheep on the grass all the year round. Nevertheless, some experiments have been undertaken on aspects of grassland management in relation to this disease. Pastures used for this work are deliberately infected by grazing affected calves on them. No advantage has been gained by rotational grazing with a grazing interval of 28 days, nor has grazing on long herbage led to more husk than when the cattle were kept on short herbage throughout the summer and into the autumn. An attempt is now being made to see whether a resistance to husk can be built up under farm conditions by grazing autumn-born calves on an infected pasture for the early part of their first summer—that is, when they are about eight months old. It is too early to say whether or not the method is successful, let alone practicable, but the results so far are promising.

Feeding trials to discover ways of cheapening the cost of rearing Friesian calves and young stores are yielding interesting results. Turning out autumn-born calves on April 1, when the grass has scarcely begun to grow, and giving them only an hour or so at grass for the first few days, is giving better liveweight gains than when the calves are kept in until late May. These early turned out calves maintain their heavier weight throughout the summer. An important result appearing in this experiment is that by being turned out early the calves gradually wean themselves from hay and concentrates, thus making a saving in the cost of rearing.

An experiment to compare the milk yields from Friesian heifers reared on different planes of nutrition and then calved down to British Friesian bulls at 24 months of age showed very big differences in the cost of rearing, but there was little difference in the milk yields of the groups in the first lactations. However, there was a very great variation in individual yields, and the experiment is being built up again with what is hoped will be heifers having more uniform yields.

Experimental work with the ewe flock is at present confined to the advantages and disadvantages of breeding from Suffolk × Scotch Half-bred ewe lambs, as compared with the more normal practice of breeding from them for the first time as shearlings. As these animals must be kept to the end of their useful breeding life, it will be some years before the full results are available. It appears, though, that breeding from a ewe lamb does not have any adverse effect on her next crop of lambs—that is, those that she has as a shearling.

This account of the Boxworth farm would be incomplete without reference to the assistance given by the Farm Advisory Committee. The writer wishes to record his acknowledgment of the great encouragement and help which he has received from the Chairman and members during the past eight years.

AGRICULTURE IN THE ATOMIC AGE

HENRY SELIGMAN

Head of Isotopes Division, Atomic Energy Research Establishment, Harwell

Many indirect benefits are likely to accrue to agriculture as the result of atomic research. The following extract from Dr. Seligman's article in *The Times Calder Hall Supplement* is reproduced by permission of the Editor.

ALTHOUGH atomic radiations have a role in agriculture, radioactive materials will hardly ever be used directly in farming. Although statements have been made that radioactivity may, for example, increase a crop, health reasons alone would prevent its widespread use, so that even if there were some truth in the claims made, no authority could ever allow such a use. Agricultural research with radioactive materials has, however, achieved fairly great successes in many fields—for example, in finding better methods of fertilizing soil. Enormous sums of money are spent annually on fertilizers, in the United States alone more than £3 million a year. Therefore, if one could find a method of using the fertilizer more economically, for instance, so that an extra 1 or 2 per cent of the fertilizer entered the plant, the savings would be in the region of £3-6 million a year; and this is what scientists claim. By using radioactive methods they have found the best time and place to apply a fertilizer.

The crops which so far have been the most studied seem to be corn and tobacco. An unexpected result was the fact that fertilizer can be fed, not only through the root but also in some cases better through the leaf. In fact, for some plants the utilization of the fertilizer is increased by a factor of nine by spraying the fertilizer on to the leaf instead of putting it into the ground.

Insecticides and Fungicides Rapid progress in the development of insecticides and fungicides has been due partly to the aid of radioactive materials. In such research only one in a thousand compounds may be successful, and the workings of these fungicides can be controlled and quickly checked by labelling them with radioactive atoms. However, research in these fields is only at the beginning, and the greatest benefits may be in the next ten to twenty years.

One of the most interesting helps to agriculture has been an ingenious method, applied by American scientists, of reducing considerably the number of Screw Worm flies, which constitute a pest. The foundation for this was the fact that the female fly will mate only once during her whole life, while the male fly does not obey this unnatural law. Scientists conceived the idea that by releasing irradiated males that had been made sterile by radiation, they could reduce the number of screw worms in the next generation. A large number of these male flies were irradiated and then released from aircraft in areas infested by the pest. A small area was thus entirely freed of this pest at relatively little cost.

Sometimes it is of help to study the paths of animals underground, and to find out how they attack crops. This has been studied in the case of the wireworm to find out at what distance this animal can smell a potato. The experiment was conducted by attaching some radioactive material to the worm, which was then allowed to move in a known area of earth. As the

activity could be detected with different counters, the movement of the wireworm could be observed by this method and its habits studied.

Plant Breeding Radiation can also produce important genetic changes, and these are being now studied by plant breeders. This study is rather difficult, as it is a "hit-and-miss" method. Irradiation of seeds or pollen increases the natural mutation rate many times. In this way, an oat resistant to infection with rust fungus has been produced in the United States, and may have a big influence on the economy of this commodity. Other scientists have reduced the height of the straw of corn, so that the crop should be less dependent on wind and weather. Peculiar leaf formations in other plants and interesting new colourings of flowers have been observed. In years to come we shall hear more about new strains being bred with this unconventional aid.

Dr. W. F. Libby, of the United States Atomic Energy Commission, has estimated that the potential saving that radioactivity has brought to agriculture in the United States is already more than £80 million a year, and he goes on to state that he thinks it a reasonable estimate that the potential contribution of atomic energy to agriculture may be as great as the contribution of atomic energy to the generation of electric power.

Several countries have started research programmes to investigate the extension of storage life of food that has been treated by atomic radiations. The principle is fairly simple; by irradiating the food one may be able to kill the bacteria, or with a lesser dose to make the bacteria infertile—and so pasteurize the food. Relatively high dosages are needed for sterilization (killing all bacteria), but the dosages for pasteurization are at least ten times lower, and therefore would have less effect on the foods treated.

Some food products seem to lend themselves well to treatment by small doses of penetrating radiations: there is no apparent change in taste, and the storage life may be extended over many months. Potatoes and onions have been so treated with great success. In other products, like milk and meat, "off odours" are produced. In all cases intensive research will have to be continued to see that no health-damaging compounds are created by irradiation, and in other cases to see if "off odours" can be avoided. I believe, however, that this generation will see foods preserved by radiation only—that is, without refrigeration.

★ *NEXT MONTH*

Some articles of outstanding interest

Agriculture in the World Economy: A Report of the Brighton Conference ● **Early Summer Lettuce** by F. A. SECRETT and C. G. FINCH ● **April Milk** by H. K. BAKER ● **Profit Levels of the Smaller Poultry-keeper** by R. COLES.

THE USES OF RUBBER IN AGRICULTURE

H. J. HINE, B.Sc.(Oxon)

National Agricultural Advisory Service, Eastern Province

The fact that one session of the recent *Rubber in Engineering* Conference was devoted to agriculture illustrates the growing importance of this commodity in farming. Mr. Hine outlines some of the many and varied uses which the agricultural machinery designers have found for rubber.

FOR more than twenty years, tyres on tractors, carts and implements have contributed in no mean measure towards easing agriculture's task of meeting the food demands of a growing world population—apart, that is, from providing a very useful market for the rubber manufacturers. But although tyres offer perhaps the most obvious example of the use of rubber on the farm, there are, of course, many other useful, and often essential, ends which this commodity serves in farm machinery and equipment. Indeed, so important is the part it plays that agriculture was chosen as the subject of one of the sessions at the Rubber in Engineering Conference which was held in London this autumn. There the main speaker was Mr. S. J. Wright, who, after giving an account of some of the many uses to which rubber has been put, suggested to rubber technologists and the agricultural engineers that the role of rubber in farming might well become even more important in the future.

Rubber Belts An outstanding example of a machine which depends for its design on the possibility of incorporating a resilient material in the structure is the pick-up baler for hay and straw. This machine, rather like a giant cigarette-making machine, uses rubberized belting and rubber-covered rollers. The hay or straw is taken straight from the windrow on to an elevator conveyor belt and delivered to a rubber-covered press roll. There it is flattened into a wide, compact mat, which is later rolled between two endless rubberized bands to form a roughly cylindrical bale.

The rubber belt is, of course, widely used in all kinds of farm machinery. Rubberized V-belts have advantages over pintle and roller chains for agricultural machinery, particularly when the work is liable to be dusty. For that reason, they are much used on combine harvesters. Rubber-cotton flat driving belts have been used with stationary threshing machines for many years, and they are also generally better than balata-cotton belts for driving other outdoor machines

The endless rubber conveyor belt principle has been used in a machine designed for spreading fertilizers, lime, or farmyard manure. The machine is essentially a tractor-drawn trailer in which the floor, instead of being made of solid boards, is a ¼-inch thick endless rubber belt supported on cylindrical rollers spaced a foot apart. As the belt moves, it carries the load towards a pair of revolving tine shafts at the rear. The tines disintegrate the material and discharge it on to an impeller shaft, which is equipped with paddles to spread it outwards.

Belts made of solid rubber or of rubberized canvas are also being used increasingly to move grain or to act as conveyors in field machinery. In the development of a particular forage harvester, which relies on conveyor belts, several kinds of belt were tried. Solid rubber conveyor belting proved to be too heavy, whereas plain canvas belting soon lost its stiffness through weathering. Special rubber-covered canvas belts, made of 18 oz

instead of 28 oz duck and reinforced with extra strips of canvas at the edges, finally provided the best answer.

Another machine which would have been difficult to design without rubber and rubberized materials is the flail used to disintegrate unwanted vegetation such as potato haulms. The rubber flail seems to be selective in action, so that when it is used on potato haulm it does less harm to the crop than a more rigid tine would.

The "metering" mechanism of a new precision drill has a rubber band with regularly spaced holes. The lower part of the band runs close to a grooved metal plate so that each hole allows one seed through the groove, from where it is carried to the point where it falls into the seed furrow. Another precision seed sowing device, intended for research work and made by the National Institute of Agricultural Engineering from Canadian components, uses a rubber belt of hollow V-section which carries the seeds towards the coulter and drops them in one by one.

Indoor and Outdoor Equipment The milking machine is an important farm machine dependent on the use of rubber. Flexible liners for the teat cups are necessary for a machine working on the principle of massage and suction, and the flexible material used also has to be such that it can be sterilized without quickly deteriorating. Rubber is used, too, for the air and milk lines.

A useful aid to the production of clean milk is a rubber brush through which running water can be applied to wash the flanks and udders of the cows before they are milked.

Rubber floors and walls are sometimes used in stables and cowhouses. Rubber mats for cow standings help to prevent grazed knees and hocks, and the greater comfort provided is said to encourage higher milk yields. The mats are grouted to the floor, so that they can be swilled down.

Rubber hose has many uses in agriculture and horticulture. Braided hose, designed to withstand pressures of 350 lb per square inch and to resist deterioration by such substances as tar oil washes, is commonly used in spraying. Water-carrying hose is also important, so much so that a special kind with an outer cover of wear-resistant rubber to protect the hose when it is submerged in a pond, dragged over rough stones, or bent at a sharp angle, is made for the farmer. An embedded helix of tough steel wire prevents collapse from suction or kinking.

Reinforced rubber tubing has been used with success in place of telescopic steel for the seed ducts of combined seed-and-fertilizer drills. Rubber lasts much longer than steel, partly because it recovers readily from kinking, and partly because it resists corrosion. Stout hose is used for this purpose, because buckling may interfere with the flow of seed down the tube.

On some potato sorters, rubber spools have been arranged side by side on rotating spindles to take the place of wire-mesh riddles. The spools are shaped so as to form circular holes through which small potatoes can pass. The brushing unit consists of rollers which have projecting rubber mouldings, and this unit is followed by spindles with small-aperture spools which take out the potatoes that are too small. Spindles with large-apertured spools let the ware fall through. These machines are accurate and quick, and do very little damage to the potatoes.

Rubber is used also in potato harvesters. One machine transfers soil, stones and potatoes on to a revolving saucer-shaped riddle, through the bars of which a certain amount of the stones and clods are lost. Those remaining, together with the potatoes, are then swept by means of rubber brushes into

rubber buckets on a vertical elevator. The stones, clods and potatoes are discharged from the elevator on to a moving rubber belt studded with rubber fingers. The potatoes roll along on the tips of these "fingers" and pass on to another elevator, which carries them to sacks or to a trailer. The stones and clods, being heavier and less regular in shape, are caught between the rubber fingers and are carried over to be dropped on the ground.

Tyres and Tractors Much research and development work has been carried out on agricultural tractor tyres, and their present, almost universal, use on wheeled tractors is testimony to the efficiency of their grip in nearly all weathers and on nearly all soils. Where the conditions demand tracklayers, rubber again has its place. Instead of the links of the track being held together by pins in bushes, rubber pads, which interlock with the edges of the steel links, are used in some models. The rubber-jointed track wears only very slowly, is noiseless, and can run at quite a high speed. The hinge movement between connecting links takes place by a distortion of the rubber. When not supporting a load, the track has considerable curvature, and even when it is under load it resists being put into reverse curvature. Therefore, a fairly flat and rigid platform is provided for the weight-carrying rollers.

An interesting point made by Mr. Wright in his paper at the London conference was that rubber has both a small-scale as well as a large-scale flexibility. The large-scale flexibility is the quality which makes equipment such as the milking machine possible, but the small-scale flexibility helps rubber to be self-cleaning. Perhaps, as Mr. Wright suggested, the fact that natural rubber is itself a product of agriculture may possibly account for its eminent suitability in so many agricultural applications.

Proposed Silo Subsidy

Grants of up to £250 per farm for the construction and improvement of silos is envisaged under a Bill which was introduced by the Minister of Agriculture on November 16. No payments can be made until final parliamentary authority has been obtained, but to enable farmers to begin work for the 1957 season, they can put forward their plans for approval now. *The written agreement of the Ministry is required before starting work.* Silos already constructed or undergoing construction are not eligible.

As covered by the proposals, a silo is a soundly constructed trench, pit, or clamp used for the making of silage. Tower silos may be included and exceptionally an unlined pit.

A free leaflet, *Proposed Silo Subsidy*, giving details of eligibility, rates of subsidy, and examples of the kind of silos likely to qualify for grant, is available from your county A.E.C., the Department of Agriculture for Scotland or from the Ministry (Publications), Soho Square, London, W.1.

A separate announcement has been made for the Ministry of Agriculture for Northern Ireland.

The Sire

HE comes into the white-fenced show ring, the cynosure of critical eyes. This is a strange world of restless coming and going, far removed from the quiet, green pastures and the comfort and security of his home farm. For all his great bulk, he moves majestically, with an easy gait, an ambassador of his breed, the sire of many merit progeny, the potential sire of many yet unborn. The excellence of his breeding shines with an heraldic splendour, and the murmur of the encircling crowd is the homage to which he was born the heir.

Setting aside the newer formulations of beef progeny testing, our beef animals are still the outcome of the "artistic eye" and the patient skill of the master breeders. In an initial swift appraisal, we look for growth for age, the symmetry of body and hindquarters, bone, character and activity on parade. We mark his docility, his short legs which carry the square compact blockiness of his body with ease and assurance.

He moves into the centre of the ring, lining up for the closer inspection of the judge. The head has the masculine boldness of the breed, the chest is deep and broad, the fleshy shoulders well laid in and the ribs well sprung. He meets you well. The top and under lines are level, allied to depth of heart and flank, together with length of frame; the tail is well set, the hindquarters wide and the thigh well-fleshed down to the hocks. The practised hand of the judge feels the flesh to be uniformly firm and resilient, the skin supple and mellow. The scrutiny and the handling go on. The points accumulate, but the margin is close. The judge weighs his decision.

It is a far cry from the old village cattle whose breeding Lord Ernle described as "the haphazard union of nobody's son with everybody's daughter" to the present level of stock breeding. And it is to the great improvers who followed in the inspired steps of Robert Bakewell that the credit must go for the supreme place which British breeds of beef cattle have won throughout the world. From the work of such men as the Colling brothers, Booth, Bates, and Cruikshank, Hugh Watson and McCombie, and Tomkins, Hewer and Jeffries, has evolved the whole concept of pedigree breeding and the raising of our stock from the nondescript to the non-pareil. Genetics as a science—the mechanism of inheritance—was unknown to them, yet their genius guided their course to attain their goal.

But despite long histories of inbreeding and line breeding for a desired aim, variation in genetic factors has not been bred out, so that the breeder today, confronted by a public demand for small, leaner joints, is able to select and breed for a smaller, earlier-maturing animal. Artificial insemination and the test tube have placed the qualities of a chosen sire within reach of the smallest farmer, subduing distance to a negligible consideration, and not least, in the essentially commercial field, the right sire can get good beef calves from the dairy herd.

The judging is over; the rosetted sire is led out, perhaps to pastures new, but still in that service to British agriculture, which his sons and daughters, in their turn, will carry on in the fulfilment of their bovine destiny.

S.R.O'H.

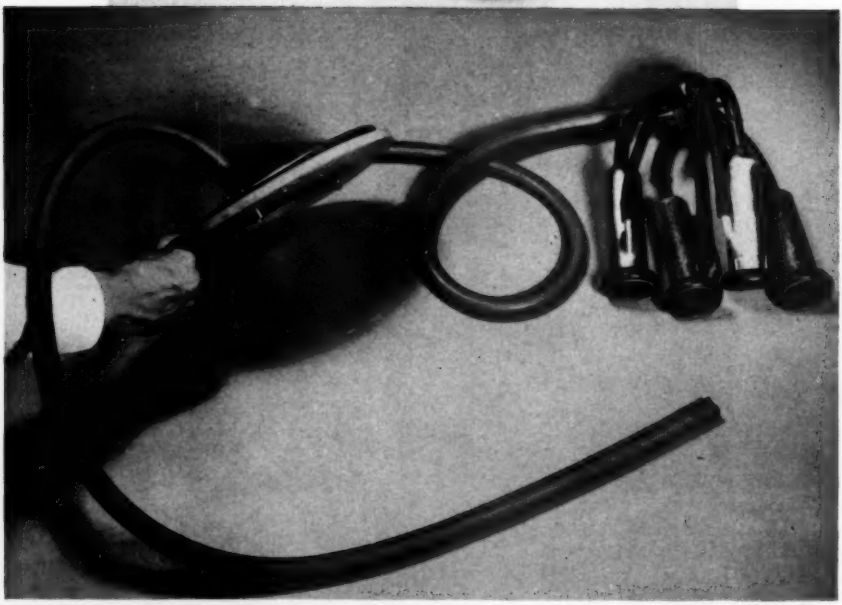
Photo: *W. Suschitzky*

Little Bursteads.

Mr. Gerald Scott, city man turned farmer, looks over a pen of Rhode Island Reds.

Some 20 acres of good pasture are devoted to poultry.

A section of the incubators.



All the milk-contact equipment from two units packs neatly into a specially-designed basket. The lower picture shows a direct-to-can unit, with its loosely attached gasket and sloping milk-inlet tube.

THE SETTLEMENT OF INDIANA

NIGEL HARVEY, M.A., Q.A.L.A.S.

Today, Indiana forms part of the prosperous cornbelt of the United States and contains some of the most productive farmland in the world. But three hundred years ago it was a green wilderness which no white man had entered. Mr. Harvey, who has just returned from a year's study as a Kellogg Fellow at Purdue University, Indiana, describes the winning of this mid-western State.

FEW phases of human activity in the last two centuries have been as important and as spectacular as the advance of the white farmers into the virgin lands overseas—in Africa, in the Antipodes and, above all, in the Americas. This advance called into existence new nations, altered the balance of power in the world, and made possible an unprecedented increase in the numbers and wealth of mankind. And few phases of this advance were more important or spectacular than the western movement of the American people. The prologue to this was the settlement in colonial times of the land between the Atlantic and the Alleghenies. The epilogue was the settlement of the Far West, some of it within living memory. But the body of the work was the settlement between 1775 and 1860 of the vast Mississippi Valley, which Tocqueville so typically called "the finest home for man yet prepared by God". The process was gradual and incoherent, involving an infinity of local movements. But the story of Indiana, once a green desolation, now a rich cornbelt state, may stand as an example of the manner in which the Republic won its mid-western territories.

Three hundred years ago, most of what is now Indiana was tall, primeval forest thickened with brush and undergrowth. It was the home of bears and deer, of wolves and wild cats, of turkeys and flocks of pigeons so vast that they darkened the sky, and also of the semi-nomadic Indians who lived partly by hunting, partly by cultivating maize in suitable patches. Only in the north and west was this green cover broken by sprawling marshes and by occasional patches of prairie-land, where wild grasses rose four feet high from roots as thick as a man's finger.

The first white men to inhabit this lonely land were the French, following La Salle, who entered it in 1669. The next were the British, and at Ouiatenon on the Wabash River you can see today a reconstruction of the blockhouse where, in the 1760s, a redcoat officer and a platoon of Shire troops idled away their time and wondered vaguely what lay in the unexplored vastnesses between their remote outpost and the Pacific coastline. But the French were hunters and traders rather than farmers, the British no more than scattered garrisons, and both were controlled by Old World governments who put Old World considerations first. Neither made any real impression on the wilderness, and it was left to a race of brave and energetic farmers careless of events beyond the oceans to convert it into some of the most productive agricultural land in the world.

The Western Movement The causes of the western movement were summarized vividly in 1793 by the Spanish governor of Louisiana, who was at the receiving end of the process. "The Americans," he warned his government, "have the unmeasured ambition of a new people who are vigorous, hostile to all subjection and have been multiplying with a remarkable rapidity." Forty years later, a Frenchman described the movement in full spate. "The gradual and continuous progress of the European race towards the Rocky Mountains," he wrote, "has the solemnity of a

providential event. It is like a deluge of men, rising unabatedly and driven daily by the hand of God." Both observers give the same impression of a steady, irresistible flood and, indeed, the speed of this colonization is a marvel to the European. It took our ancestors centuries to win our farmland piecemeal from the ancient waste. The Americans settled much of their country in two lifetimes.

Partly, of course, it was a matter of sheer numbers. The men of the moving frontier were numerous and they were continually reinforced and urged onwards by newcomers from the southern and eastern states or from overseas. For the frontier offered most things to most men—freedom from rent to tenants, new estates to landowners, new opportunities to professional men, and, above all, cheap farms to "the ambitious but respectable poor", who formed the bulk of the settlers. Partly, it was a matter of quality. America has traditionally been peopled by a singularly energetic and adventurous stock, for it is commonly such men who emigrate, and the frontier took the most energetic and adventurous even of these. But it was also a matter of tools. Admittedly, the pioneers were in many ways little better

The Moving Frontier, 1800-60

The frontier was officially defined as an area containing more than two but less than six people per square mile. It will be seen that the frontier-line passed across most of Indiana in only thirty years.

equipped than our medieval forefathers. They travelled by boat or horse and wagon, they reclaimed land without machinery, they sowed by hand and they cultivated with crude implements. But they had three great advantages over their predecessors in the Old World.

Tools of the Pioneers The first of these was the long-barrelled Pennsylvania rifle, a light, graceful and deadly accurate weapon developed by migrant German gunsmiths who inherited the traditions of the Renaissance craftsmen. In skilled hands, it could kill a man or a beast at three hundred yards or bring down a squirrel from the tallest tree. The second was the heavy-polled, light-bitted American axe, which was mass-produced by the Collins brothers as early as the 1820s. The third was maize, a crop easy to plant, rapid in growth, heavy in yield, and requiring little labour either in storage—since it could stand out all winter in its weatherproof shuck—or in processing into human food. Certainly maize was a far more effective tool for frontier purposes than wheat.

Together these tools armed the backwoodsman for Indian fighting, hunting, reclaiming and farming. In the marksmanship of the men of Bunker's Hill, in the huge, muscular hands of Abraham Lincoln, the Illinois rail-splitter, the imprint of whose strength is still preserved in the plaster casts, in the endless cornfields of modern Indiana, you can see something of the forces which went to the winning of the American Middle-West.

The American invasion of the Indiana wilderness started at the end of the eighteenth century and it came with the tireless and formless power of the sea-tides. The first to come were the borderers, tough, restless men who for a generation had kept ahead even of the limited civilization of the settled frontier districts and whose background was the War of Independence and Indian fighting. Such a man would make a small clearing in the forest, build himself a "half-faced camp"—a three-walled log hut whose only protection on one side was a curtain of skins—and plant a few acres with maize and vegetables. But he would rely for his food more on his rifle than his hoe and he lived largely on the animals and birds he shot. Then, when game grew scarce and his ears were vexed by his neighbour's gun and his eyes by his neighbour's smoke, he would leave for the further west, and a more settled, more agricultural family would succeed him.

These newcomers would abandon the half-faced camp for a true log cabin, a single room, single-storey structure of unbarked logs notched together, made watertight by mud plaster, lighted by windows of stretched skins, and finished with a stone fireplace and a chimney of clay-rendered sticks. So great was the backwoodsman's mastery of his environment that many of these early cabins were built without iron of any sort, even the doors being hung on leather hinges. The settlers would then gradually enlarge the clearance, deadening the trees by girdling them, felling them, cutting off the branches for firewood and, finally, rolling the logs together for burning. Both cabin-raising and log-rolling were communal functions (it was the laborious enthusiasm of candidates for local office at the latter gatherings which added a new phrase to political language), for co-operation on the frontier was not so much a virtue as a necessity. Meantime, the stumps would be bored and filled with water to split and disintegrate in the winter. Thus would settled agriculture start in "the wooden country".

A Harsh Life This generation would clear trails through the woods, build rough bridges over the streams, and found schools and courthouses, "exhibiting", as a contemporary expressed it, "the pictures and forms of plain, frugal, civilised lives".

The basis of this plain, frugal, civilised life, however, was a picturesque, wasteful and highly uncivilized form of agriculture. In his truck garden the farmer grew his vegetables, in his fields maize or wheat as his bread corn, generally on a rotation pleasantly described as first year corn, second year corn-and-weeds, third year weeds-and-corn, fourth year weeds. His cattle grazed on the wild grasses, his long-legged, razor-backed hogs lived medieval-fashion on nuts, roots and small animals in the woods, his poultry scavenged around the house. He won his sugar from the maples or his hives, his meat came mostly from game, his salt from springs, his fruit from the forest or from an orchard, his clothes partly from flax, partly from skins. He could seldom keep sheep, since the wolves preyed on them and the briars and burrs in the woods ruined their wool. His wife, following the same self-sufficient tradition, busied herself making soap, hackling flax, gathering herbs and dipping string in tallow to form candles. And all the time, with incredible physical effort, the work of reclamation continued and the encircling trees receded further and further away from the scattered homesteads.

It was a harsh and monotonous life. It was also commonly a short one. The Indian danger, it is true, disappeared early; Harrison's victory at Tippecanoe in 1811 broke the power of the red men and the last tribe was deported, under conditions shameful to American pride, to the Far West in 1838. But the malaria from mosquitoes in the forest pools and the dreaded "milk-sick" caused by milk from cows which had eaten the snakeroot weed continued. So did the steady exhaustion of daily life. Many died prematurely. The milk-sick killed Lincoln's mother and his fiancée and drove his father from his Indiana holding. In 1821 fever killed one-eighth of the village population of Indianapolis. Many were enfeebled temporarily or permanently. Malarial ague was so common that it was not regarded as an illness—"he isn't sick, he has only got the shakes"—while a letter written from father to son in 1847 provides a pathetic commentary on the general standards in the new lands. "Your letter found us in good health. Your mother is not well and Margaret has ague and fever. I am able to work a little." The Americans did not win their land empire cheaply. Their sufferings and efforts were as great as their achievement.

The Final Phase Nevertheless, the work was done and civilization established in the backwoods. Then came a third period of consolidation which saw the end of the frontier times. Population increased. In 1800 there were only some five thousand white men in Indiana. By 1816, when the territory was incorporated into the Union as a State, the number was over sixty thousand, and by 1850 nearly a million. New industries developed, some later to become famous; in 1852, for instance, the Studebaker brothers began a wagon-building business in South Bend. Villages became towns. Broadcloth and silks replaced leather and homespun. Houses were built of brick instead of timber. The iron network of the railways connected the new communities with the rest of the country.

With the coming of the new order, some of the original settlers sold their holdings and migrated to the opportunities which still lay ahead; others stayed and prospered in the new life. Meanwhile, the frontier still rolled on towards the setting sun. First came the borderers . . . then came more settled, more agricultural families . . . and so it continued.

It was in this last period that the final attack was made on the Indiana waste. The family farmer with axe and plough could win his land from the forests which covered over three-quarters of the new State. Once felled, the encumbering trees became essential raw materials for houses and buildings,

fences and fuel. But the homesteaders halted at the bleak prairie. It yielded neither shelter nor timber, its matted sward defeated the ploughs which they brought from easier soils, and it lay too level for effective natural drainage. It was won by an alliance of technology and capital. In 1837 John Deere of Illinois developed the first steel plough which could break this stubborn grassland, and a little later men like Ellsworth, realizing the fertility of these deep, black soils, persuaded wealthy investors in the east to sink huge sums in drainage, building and fencing. To this day, the low proportion of owner-occupiers in the old prairie counties reflects this substitution of imported capital for home-grown labour.

The reclamation of the prairies left only the swamps in their primeval condition, and their turn came at the end of the century, when many of the marshes in the north-east of the State were drained and the 30,000-acre Beaver Lake disappeared from the map. Lake Village still preserves its memory. So does a sand hillock which was once an island in the middle of the lake, where the cruder type of frontier tradition made its last stand in Indiana. After the Civil War, a band of outlaws established themselves on this island and plagued the countryside till they were liquidated by a local Citizens' Committee. In Lake Village they still show you the store in front of which the criminals were hanged.

The winning of Indiana took, therefore, just about a century, and much of it could have been witnessed by a man between childhood and old age. Charles Cathcart, for instance, staked a claim in the wilderness in the 1820s by carving his name on a tree and narrowly escaped death at the hands of an Indian war party in the process. He lived to introduce Jersey cattle to Laporte County in 1876.

Even more dramatic was the career of John Chapman, the famous "Johnny Appleseed", who spent much of his life in Indiana. He has now joined Bunyan the tree-killer in American mythology. But he was a real man, who spent his childhood on a Pennsylvania farm and his manhood travelling westwards with the frontier, preaching the gospel and planting apple trees for the health and sustenance of the settlers as he went. In middle age, during the war of 1812, he had ridden along the frontier settlements to warn the inhabitants of an Indian invasion, and the words of his scriptural cry remained sixty years later in the memories of elderly men who had heard it as children: "Flee for your lives, the tribes of the heathen are around your door and a devouring flame followeth after them." But when he died in 1845, the railway had nearly reached Indianapolis, the new State's new capital, where the legislators, the Indians forgotten, were debating educational policy.

Relics of the Past At first sight, modern Indiana strikes the English visitor as essentially a new country. In most areas, a building over seventy years old is a rarity. But he soon finds survivals to remind him of the State's heroic past. In the huge parks he will see the sort of landscape which the pioneers found over a century ago. He will be told of a small area of virgin prairie near Crawfordsville which was brought into cultivation only a few years ago; it was infested with rattlesnakes, very rare elsewhere in the country, and contained certain curious depressions which were once buffalo wallows. He will be told that the last cheetah was killed in 1950 and that there are still wolves in the wooded hills in the south of the State; one of them drifted north a couple of years ago to astonish farmers near Lafayette. He will also see an occasional log cabin. Most of these which survive have now been boarded over and converted into outhouses, but there is one still standing in its original state within walking distance of

the huge modern campus of Purdue University. And wherever he looks he will see the great, square land-pattern established by the forgotten surveyors under the famous Ordinance of 1785.

Above all, if he is lucky, he will sit one evening in a centrally-heated farmhouse after a good dinner, complete with iced beer from the refrigerator and strawberries from the deep-freeze, and hear his host repeat his grandfather's stories of the forests, now vanished, where he hunted wild turkeys, now extinct in these parts, and the Fourmile Swamp, which is now the rich maizeland on the other side of the hill. The experience is fascinating, rather like hearing a contemporary account of a clearance in the Andredsweald or the cutting of Morton's Leam. It would, indeed, still be possible to reconstruct much of the history of the Indiana settlement without the aid of books. The past is very close in Indiana, and the people of the State have good reason to preserve and cherish its memory.

DAIRYING IN ISRAEL

W. P. JAFFE, PH.D.

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The writer, who is a lecturer in Animal Husbandry at Bristol, recently visited Israel as the holder of the Wyndham Deeds Travel Scholarship.

ISRAEL is about the size of Wales; but more than half of it is desert and the rest suffers from drought during the Mediterranean summer, which lasts from May to October. Although the soil is not particularly fertile, land is the principal natural resource and agriculture the most important industry. Its animal products do not compare in importance with citrus fruits and grain crops, yet they play an important role in the food supply of the country. In terms of value, milk (both from dairy cows and from sheep) accounts for over half the products from the livestock sector.

Nearly all the dairy cows in the country are Friesians of one type or another. The breeding policy of the early Jewish settlers was to cross bulls imported from Holland with the best cows to be found locally, and to back-cross the offspring to Friesian bulls. A strain derived from Syria—the Damascus—was the one most widely used for this purpose. Continuous back-crossing has not, apparently, led to any lack of fitness in terms of milk production. On the contrary, the average production per cow has risen steadily from year to year and is now over 1,000 gallons per lactation. Recently, a number of pure-bred heifers were imported from the United States, and it was found that they compared favourably in yield with the locally bred animals. There are, in all, about 30,000 milking cows in Israel, of which 45 per cent are officially recorded.

Skilful Management This astonishingly high level of milk production naturally requires a corresponding level of management. The fact that most of the farmers were formerly city dwellers makes the achievement all the more remarkable. It could only come about by virtue of the outstanding feature of Israeli agriculture—the organization of settlement in close-knit communities, which permits a degree of voluntary co-operative effort probably without equal anywhere else in the world.

DAIRYING IN ISRAEL

Broadly speaking, there are two systems of keeping dairy cattle in Israel. In one, the cows never go out to pasture at all but are confined to open sheds, where they receive all their food, including green fodder. This works well in practice and is the only possible way where pastures are difficult to establish. Another advantage claimed in its favour is that it permits higher yields of green crops per acre than are possible under grazing. The second system includes a certain amount of grazing, usually early in the morning and in the late afternoon, for most of the year.

Systems of feeding are infinitely variable, but most farms use some hay, silage, roots and green fodder. Concentrates mixtures are fed according to yield and allowance is made for variation in the composition of the maintenance ration. Mangolds are the root crop most widely grown. Under irrigation they give excellent yields (over 100 tons per acre is not unusual), but their use is limited to the period from April to September. Efforts are now being made to find a crop that will take their place for the rest of the year, and one or other of our forms of feeding kale has been suggested for this purpose.

It is probably to the first-rate management of green crops that much of the credit for the high milk yields must go. Skilful management ensures a succession of crops, ranging from red clover to lucerne, to provide a continuous supply of green feed throughout the year.

Dairy layouts vary widely. On some of the large progressive settlements the arrangements are very impressive and compare with the best anywhere, often featuring two-level milking parlours and auto-releaser milking machines discharging into bulk storage tanks. Buildings are light and airy, consisting of asbestos-covered roofs with supports of tubular steel. At the other end of the scale are the small, dark cowsheds of many smallholders, where conditions are decidedly unhygienic.

A.I. and Progeny Testing Artificial insemination was first used commercially in Israel in 1934. Since that time progress has been rapid, until today over 85 per cent of dairy cows are bred artificially. The virtual absence of telephones in the countryside necessitates daily journeys by the inseminator. Travelling is reduced by an ingenious system of "bush telegraph". This may take the form of a board at the farm gate or, more picturesquely, a flag hoisted on the silo, visible for miles around, announcing that no services are required.

Conception rates are generally lower than they are in Britain, despite the fact that there are probably now no cases of *Vibrio foetus* and virtually none of brucellosis. The great seasonal variation in fertility suggests that climatic factors are probably involved.

In 1951 the Department of Agriculture initiated a progeny testing scheme for A.I. bulls, and in recent years as much as one-third of the breedings have been to "proven" bulls. Information on the performance of a bull's daughters are published in three ways—the average production of the daughters, dam-daughter comparisons, and contemporary comparisons. Only the last of these is of much use in identifying superior bulls, and even then its use is limited by failure to correct for the number of daughters tested and the number of contemporaries available. It is doubtful if much genetic progress has yet been made in dairy cattle in Israel, other than by the accidental introduction of good bulls from abroad.

Milk Sheep The milk sheep used in Israel is an improved strain of the local Arab or Awassi sheep, in which selection for milk production has been carried out by means of a recording scheme coupled with ram

licensing. Under this system, only farmers with flocks exceeding a certain minimum level are permitted to sell rams from their best ewes, and over the sixteen years the scheme has been operating, average yields have increased from 40 to 50 gallons per lactation of 5-6 months.

One is tempted to question the wisdom of expending effort on such small returns. Apparently sheeps' milk is in great demand for cheese-making because of its high solids content, and thus it is a profitable business. Nevertheless, the visitor is left with the strong impression that the limited resources would be better used for raising mutton and wool, particularly since Israel suffers from an acute shortage of home-grown meat. In fact, flocks of Corriedales and Rambouillet have been imported from Australia and Argentina and are doing well in their new surroundings.

Astonishing Progress The advances in dairying, as indeed in the whole of agriculture, in the few years since the establishment of the State, have been astonishing. In eight years the output of dairy products has more than doubled, and the industry has been modernized by the introduction of pasteurization and the widespread use of milking machines. During this time there has been a shortage of most agricultural products, but the situation is rapidly changing. The local demand for liquid milk has now been met, although at a level considered inadequate from the nutritional point of view in this country. Consequently, increases in supply are likely to lead to lower prices, and unless farmers can reduce their high costs of production the profitability of dairying, which is already low on many farms, will probably decline further. The demand by farmers for a higher Government subsidy to meet this situation and the clamour by other sections of the community for its reduction is one feature of dairying in Israel with which the British farmer will be familiar.

Israel's achievement in creating a modern and efficient agriculture in the face of climatic and economic difficulty merits the closest attention of all countries with similar problems.

It is a pleasure to thank the Anglo-Israel Association, who awarded me the scholarship, and the University of Bristol for granting leave of absence. Of the many people in Israel who gave their willing co-operation, none deserves greater credit than Mr. M. Heiman, of the O.N. Cattle Breeding Centre at Sarid.

R.A.S.E. Research Medal

The Royal Agricultural Society of England offers annually a medal, together with an award of one hundred guineas, for research work of outstanding merit carried out in the United Kingdom which has proved, or is likely to prove, of benefit to agriculture.

Recommendations for this award can only be made by the Heads of University Departments, Research Stations and Institutes and other research establishments, and should be submitted to the Secretary of the Society, 35 Belgrave Square, London, S.W.1, not later than January 31, 1957. They should be accompanied by nine copies of a brief statement of the candidate's attainments and a list of his publications.

THE THIRD BRITISH WEED CONTROL CONFERENCE

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IT is impossible in a brief article to cover all the matters discussed at the British Weed Control Conference, held at Blackpool on November 6-8, 1956, for there were presented to an audience of over 400 people, including representatives of several foreign countries, no less than seventeen formal papers and sixty-four research reports. Some idea of the scope of the conference can be gained from the following list of subjects covered by the formal papers: the development and use of weed-killers for efficient food production; weed control in Canada and Sweden; the principles of selective toxicity; factors affecting the performance of chemical compounds used for industrial weed control; the place of MCPB and 2,4-DB in British agriculture; the factors influencing the relative toxicity of the phenoxybutyrics and their corresponding acetics; the development of spraying machinery; and the place of the merchant in handling weed-killers.

An interesting feature of the research reports was the evidence of the amount of work being undertaken on a number of outstanding weed problems. Wild oats, blackgrass, couch and other perennial grasses, bracken and cleavers were all discussed. As is to be expected with any new developments, there are many points that still require elucidating before practical recommendations can be made on some of the techniques discussed, but the farmer can be reasonably satisfied that attention is being given to some of his more pressing weed problems.

Wild Oats During the past ten or fifteen years wild oats have become a major weed problem, and some aspects of chemical control in peas and sugar beet, using trichloracetic acid, propham (*iso*-propylphenyl-carbamate) and chloro-*iso*-propylphenyl carbamate, were discussed at the 1954 British Weed Control Conference[1]. Other chemicals have since been tested, but trichloracetic acid appeared the most promising, and subsequent developmental work has been confined largely to this compound. Reports presented at Blackpool show that pre-sowing treatment of the soil with trichloracetic acid is a practicable means of reducing wild oat infestations. The effectiveness of soil applications of weed-killers is, of course, dependent upon soil conditions, and results can vary according to circumstance, but it appears that a 60-90 per cent kill of wild oats may generally be achieved by applying 7½ lb trichloracetic acid per acre, and that such an application is safe where sugar beet and (on less evidence) kale is to be sown two weeks later. The same treatment appears to be a little more risky on peas, for a 5-10 per cent reduction of crop yield has sometimes been seen, and one report suggests that treatment is perhaps only worth while where there is a heavy infestation of wild oats, or where a determined effort is being made to eradicate the weed by all available means.

Another report showed that trichloracetic acid can increase the susceptibility of peas to dinoseb, and that following pre-sowing treatment with trichloracetic acid, the application rate of dinoseb must be reduced if the crop is not to be damaged. A number of broad-leaved weeds, however, also become more susceptible to dinoseb following soil treatment with trichlor-

acetic acid, and the selectivity of dinoseb may therefore be of the same order on both treated and untreated crop-weed combinations.

The control of wild oats in cereals presents an even greater problem than in crops unrelated to the weed, but promising new chemicals were reported for use in cereals, particularly barley. The chemicals are 2-chloroallyl-diethyl dithiocarbamate (CDEC) and α-chloro-N, N-diallyacetamide (CDAA), which, when applied to the soil some two weeks before sowing the crop at rates of about 12 lb per acre, have given up to 90 per cent control of wild oats. Crop damage was reported in several experiments but not in others, so soil conditions may well be responsible for the variability in results. Further research is required on this aspect, but in the meantime normal husbandry methods must remain the principal weapon against wild oats until a safe and economic method of chemical control in cereals has been developed.

Other Weed Grasses Many farmers are now familiar with the use of trichloracetic acid for the control of couch (*Agropyrum repens* and *Agrostis stolonifera*) in arable fields. As trichloracetic acid is absorbed only by the roots and rhizomes of grasses, the land has to be ploughed and the couch worked towards the surface before the chemical is applied. Good control was reported to have resulted from the use of another chemical, called dalapon (2:2-dichloropropionic acid), which, in contradistinction to trichloracetic acid, is absorbed by both the roots and *leaves* of grasses. Ploughing and cultivation therefore appears not to be needed before application, which could be made, for example, to the foliage of the couch in stubble—ploughing being delayed for about a month to allow time for the absorption of the chemical. A report indicated that dalapon was also promising for the selective control of weed grasses in lucerne.

Another troublesome grass weed is blackgrass (*Alopecurus myosuroides*), particularly in herbage seed crops. Trials were reported which indicated that propham and chloro *iso*-propylphenylcarbamate applied in October at 3-4 lb per acre might be useful for the control of blackgrass in established crops of timothy, meadow fescue and cocksfoot.

Cleavers Some new chemicals that have given good control of cleavers (*Galium aperine*) in cereals were reported on at the Conference. Up to the present, the only chemicals giving a satisfactory control have been DNC and sulphuric acid, both of which are unpleasant to use and require application at a high volume. The advantages of the new compounds are that they are not toxic like DNC nor corrosive like acid, and they can be applied at low volume. The control of cleavers resulting from the best of the treatments has been of the same order as that obtained with DNC.

MCPB and 2,4-DB At the 1954 Conference the new range of phenoxybutyric weed-killers was described. During the past two years a large amount of research effort has been put into evaluating two of the most outstanding of these weed-killers—MCPB and 2,4-DB—and the reports presented at this year's conference give the following indication of their usefulness:

1. The range of weeds controlled by these chemicals is rather less than with MCPA or 2,4-D, but many important agricultural weeds are susceptible to MCPB and 2,4-DB at doses of between 1½ and 3 lb per acre.
2. Although MCPA and 2,4-D may not be safely applied to spring wheat and spring barley until the crop has reached the stage where there are five leaves on the main stem, MCPB and (2,4-DB on barley only) appear to be

safe at rates suitable for weed control once the first leaf has emerged. Elliott[2] has demonstrated that increased yields can be expected from the early removal of weeds in cereals and that better control of weeds can result from treatment at an early stage of growth.

3. MCPB and 2,4-DB are less toxic to red and white clover than MCPA or 2,4-D, both of which are risky on clover. MCPB and 2,4-DB appear to be safe to use at doses of 1½ lb per acre, or perhaps more on seedling clover once it has passed the cotyledon stage. On established white clover in leys and permanent pasture, MCPA at rates used for weed control can cause a suppression of white clover which may, in some circumstances, persist for two or more years. MCPB and 2,4-DB, on the other hand, appear to be a good deal safer, and at doses of up to 3 lb per acre appear to have little effect on the clover. Clover for seed has been damaged by MCPB and 2,4-DB, but in view of the need for a selective herbicide in clover seed crops, further research is warranted.
4. The reports on the use of MCPB in peas show that varieties differ in their susceptibility, and experimental work will be necessary for a number of seasons to make sure on which varieties MCPB is reliable. On resistant varieties, MCPB appears to have a useful place for the control of weeds such as creeping thistle and annual nettle, which can be of considerable nuisance in vining and picking peas.
5. MCPB or 2,4-DB may also find a place for weed control in other forage legumes, field beans, celery and potatoes.

Pre-emergence Weed-killers Pre-emergence weed-killers (that is, weed-killers that are applied to the weed or soil surface before the crop has emerged) have been studied and developed in recent years. Selectivity depends in part upon the fact that protection is afforded to the germinating crop by the soil, while the more quickly emerging weeds near the soil surface are killed by the chemical. An ingenious means of increasing the selectivity between crop and weeds described at the conference consisted of placing a protective layer of absorbent material above the crop seeds in the soil. A machine was exhibited which opens a seed furrow and sows the seed, partially fills the furrow, places in it a narrow band of absorbent material, and finally completes the filling of the seed furrow and sprays a pre-emergence weed-killer on top of the soil.

The foregoing represents only a fraction of the subjects which were discussed at the conference. Anyone who wishes to read the papers and reports in full should obtain a copy of the Proceedings of the Conference, which will be available in two or three months from Mr. W. A. Williams, British Weed Control Council, Cecil Chambers, 86 Strand, London, W.C.2.

References

1. The Second British Weed Control Conference. S. A. Evans. *Agriculture*, **61**, 485-7.
2. MCPA for the Control of Weeds in Spring Oats. J. G. Elliott. *Agriculture*, **62**, 574-7.

LOW VOLUME SPRAYING

Conference at Bury St. Edmunds

THE fundamental difference between low volume and high volume spraying is that in the latter case it is the aim to wet the *whole* plant surface with spray fluid. With low volume, using a mist spray, it is possible to control fungus or insect pests with a deposit covering only 5 per cent of the leaf surface. So said MR. J. B. BYASS of the National Institute of Agricultural Engineering, speaking to over three hundred growers at the one-day conference on low volume spraying organized by the Murphy Chemical Co. at Bury St. Edmunds on November 1. Here is a new field with a host of new problems—in particular, the way in which various chemicals work in relation to the amount and pattern of the spray deposit—but with an increasing commercial acreage being sprayed each year, evidence is beginning to accumulate.

The Grower has to Decide Why should a grower depart from conventional high volume spraying in favour of low volume? He will have to assure himself that concentrate spraying will give him at least as good a control of pests and diseases; if it does, his outlay on chemicals should be less, and its application, down to 5 gallons per acre at least, quicker and therefore cheaper. Experience at the National Institute of Agricultural Engineering, said Mr. Byass, shows that the amount of spray landing on a tree does not vary greatly between a mist spray and medium volume applications with a swirl nozzle spray. High volume would certainly give more run-off—and that means waste. He was critical of some existing machines which, he thought, are not making the most of the opportunities presented by the swing to low volume spraying. "The main thing about any low volume orchard machine is that because of the smaller drops involved it is necessary to have air to carry them. This air can also be used to break up the spray, and it is therefore unnecessary in the light of our present knowledge of the use of air to continue to fit machines with expensive and relatively complicated high pressure pumps and swirl nozzles. Nor is it generally desirable to use a low velocity air stream for carry and a high velocity (compressed air) stream for break up, as this adds to the capital cost and maintenance of the machine . . . New machines are, however, being developed, and I would recommend you to look for a machine (1) without a high pressure pump, (2) with an output which can be varied from ½ to 5 gallons a minute to allow the use of any materials not formulated for very low volume work, (3) with a drop size at ½ g.p.m. output suitable for concentrate spraying, and (4) above all which will do your particular job much faster than before. There is no point whatever in going over to low volume if you do not take advantage of the elimination of cartage and filling time."

MR. B. W. WULFF pointed to the dangers of uneven distribution. The first essential is that the spray should be of an even strength of wash throughout the operation. When spraying at low volume, high concentrations are inevitable, and if wettable powder formulations are used, a hundredweight or more may well be required to each tankful of water. Unless the agitation system is properly designed, this powder will not be dispersed uniformly, and some may not be dispersed at all.

LOW VOLUME SPRAYING

The Trend to Concentrates Recent developments in low volume spraying have been along the lines of still further reducing the volume to the point of applying concentrated materials (for example, lime sulphur) with no added water at all, and MR. B. D. A. TUCKER (N.A.A.S.) had this to say about concentrate spraying: "It has long been recognized that certain spray fluids in common use can, under some conditions, cause damage to foliage, fruitlets, etc. For example, lime sulphur applied at normal strength to Cox in cold weather, or where a cold spell follows application, can be very damaging. Again, where tree condition is not all it should be, the risk of damage is also increased. We have all been familiar with these happenings in the past with normal high volume spraying. It is my feeling that such risks can be increased when more concentrated material is used under adverse environmental conditions, and this I think is the reason why severe damage has sometimes occurred following applications at the lower volumes, and especially at the concentrate level, in some cases, whilst in others everything has been entirely satisfactory."

Something like 2,000 acres of fruit have been sprayed successfully in the eastern counties during the past two or three years with volumes from 200 to 100 gallons per acre, and the materials used have included lime sulphur, wettable sulphur, mercury, captan, BHC, DDT, lead arsenate and summer ovicides. Red spider and Codling moth have not apparently been so well controlled as by high volume spraying, but faulty timing may have been responsible for this in some instances. In orchards where mildew is a problem (and there are many in East Anglia), it seems that spraying at the lower volumes with lime and wettable sulphurs has not given anything like adequate control.

"On balance, however, it would seem," said Mr. Tucker, "that the overall advantages of low volume spraying are such that most growers would not willingly go back to high volume application. The system shows marked economy in water and water transport, economy in time with better timing of sprays, and economy in materials."

Toxic Hazards MR. N. K. SMITH, of Murphy Chemical Co., spoke of the toxic nature of certain spray chemicals, and the hazards associated with their use. "In conventional high volume spraying," he said, "these risks are recognized and can readily be guarded against. In the relatively new technique of low volume spraying, sufficient reliable experience has not yet been accumulated. Here practice and mechanical advances in machinery appear to be preceding theory or scientific and toxicological justification for the techniques employed. This can constitute a real danger with the more hazardous or 'poisonous' chemicals. It is therefore regrettable that such hazards have not been more fully investigated under practical field conditions. Too much of our basic toxicological information derives from laboratory tests. In general, it is obviously preferable to apply a toxic chemical by high volume, since pressure and droplet size can be much more readily varied than with low volume machines, to take into account weather conditions at time of spraying, and thus to reduce the hazard to operators and adjoining crops."

His remarks, he said, were not intended to be critical of the safety of low volume techniques or to exaggerate the hazards of certain chemicals. Their purpose was merely to point out potential dangers and to plead for caution, commonsense safeguards and—a point often disregarded—a careful reading of directions.

FARMING AFFAIRS

The Dairy Show, 1956 London in the autumn connotes among other things metropolitan the Dairy Show at Olympia. It was seventy years old this year, and as bright and sprightly as ever. The total attendance over the four days, October 23-26, was approximately 75,000, among which a record number of overseas visitors, from the Commonwealth, Europe and America, were clearly and vocally in evidence. Last year's attendance figure was just over 86,000.

Foot-and-mouth disease restrictions had their inevitable effect on the stock entries this year: only 278 animals were actually stalled, compared with 348 last year, but nevertheless the competition in all classes was good. For the second year in succession, and the ninth time since the series was started, the Ayrshire team carried off the Bledisloe Perpetual Challenge Trophy, which was presented by Lord Bledisloe, now in his eighty-ninth year. Under the new rules introduced this year, production and inspection points for the Ayrshires totalled 680.7 and 500 respectively, compared with their rivals and runners-up, the Friesians, which aggregated 649.32 and 350. The judge was Capt. G. O. Archer. To the Ayrshires (Mr. W. Tough's "Carbrook Aerial 17th") also went the supreme individual championship.

The Buckhurst Trophy (awarded on the basis of three lactations plus live weight and inspection), was awarded to the Jersey "Polperro", owned by Mr. and Mrs. J. Lloyd-Jones. This is the seventh time in eight years that the Jerseys have crested the wave of this inter-breed contest.

Messrs. Moffit and Sons' excellent trio of Friesians won for them, on inspection, the Terling Cup, whilst the Calvert Cup for the best Dairy Shorthorn female on inspection went to Mr. W. Wilson's "Hastoe Winsome".

A new prize, which created no small interest, was the new Panorama Trophy, presented by the B.B.C. for the best milker among herdsmen. Judged by Mr. Clyde Higgs, the competition was televised on the Panorama programme. The winner was Mr. C. Jones who comes from Hertfordshire, beating Mr. B. Tinsley of Surrey, to second place.

Not all farmers are yet reconciled to cows without horns, and this year's championship competition, on inspection, for dehorned animals was, very naturally, a prominent topic of conversation. The B.D.F.A. is to be congratulated on the innovation. Guernseys, British Friesians, Ayrshires, Jerseys and Lincoln Reds competed. Judged by Mr. Frank Palmer, the award of a leather upholstered chair, presented by the Leather Institute (who have no small interest in getting their hides whole) went to Mr. J. M. Logan for his almost all white Ayrshire "Beauchamps Orange Blossom 4th". The Hide and Allied Trades Improvement Society, similarly concerned, offered a prize in each breed for the best dehorned animal.

For the first time since 1951, the Welsh Blacks were here again, Lady Shelley-Roll's "Hendre Greta" topping the entries.

The poultry section of the Show made a truly impressive display of birds from many breeds, all in splendid fettle and, as I had the impression, in no way embarrassed by the compliments being bestowed upon them. Dairy stock, by contrast, always seem to be rather self-conscious of their rosettes!

Farm and Forest: 21. Selling Timber It was suggested last month that the farmer should consider selling his trees standing. But in certain circumstances it may be more convenient to sell at stump or extracted to roadside, or he may be obliged to do this if he finds it difficult to dispose of his timber standing. Before doing so, it is well to take a look at what is involved. First, the trees have to be felled. This is not too difficult with small trees measuring a few inches in diameter at the butt and, say, 30-40 feet in height; but where the trees are larger, skilful felling is needed to avoid damaging the tree when it falls (bad felling can split or shatter the pole) or damaging neighbouring growing trees. All branches must be removed cleanly, leaving the pole free of "snags"—that is, stubs of branches. These snags could be very troublesome when handling the tree and, in any event, will have to be removed before the pole is sold.

Next, the timber must be taken out of the wood to the roadside. Poles of the size found in young conifer plantations can usually be carried out by two men, but if the poles are over 6 inches in diameter at the butt, a horse may be needed. Really large trees, say, over 10 inches in diameter at the butt, may require a winch and tractor, and this will probably mean employing a contractor who will have all the necessary equipment and, not least, the skill for what can be a very difficult task.

Full length poles, once extracted, should be sold to a timber merchant wherever possible, as this is by far the easiest outlet. The farmer may, however, have to find his own markets. Some buyers, including the turneries (for birch, sycamore and some other species) and the rustic wood trade (for small conifer poles) will take full length poles, but larger conifer trees can sometimes be disposed of more readily by sawing off the butts and offering these to merchants dealing only in the larger dimensions of round timber, such as the box manufacturers, or the saw-millers who supply them. The tops can be sold to other markets, such as the rustic trade already mentioned, or used on the farm for fencing stakes, harvest poles, etc. Whatever the outlet, however, it is essential that the specifications for the particular market are known before any cutting is done, so that the buyer gets what he wants and there is no wasteful cutting. This is particularly important with the mining industry, which is by far the biggest buyer of prepared round timber. The N.C.B. usually buys through agents who can supply details of the specifications in demand in a particular locality.

The marketing of timber is a complicated business, and these notes serve only as a guide in meeting the problems that may have to be faced. There are several co-operative societies, forestry contractors and firms of land agents who can help in marketing matters and, should the normal trade channels prove inadequate, the farmer is strongly advised to consider using their services.

C. D. Begley,
District Officer, Forestry Commission

At the Farmers' Club: AGRICULTURAL CO-OPERATION Agricultural co-operation had an outspoken champion in Sir Frederick Brundett at the Farmers' Club meeting on October 31. "With a turnover of £100 million this year, agricultural co-operation has reached the realms of big business," said Sir Frederick, "but I am prepared to forecast that the 1956 turnover will be doubled within the next five years and doubled again in the next ten".

We in this country were a little behind some others in developing agricultural co-operation in the sense in which it is now known, and it was not until 1867 that the first agency was set up. Growth for the first thirty years or so was spasmodic, and many of the gains made were lost again in the

1920s, so that just before the Second World War there were still only some 230 societies, with a membership of 86,000. The annual turnover was about £13 million, of which the sale of requirements accounted for fully £10 million. With the end of the war, however, things began to happen. In 1945 the number of societies had been reduced to 205, but the membership had risen to 108,000 and the turnover to £25½ million, of which £12 million represented the sale of requirements. By 1955 the membership had increased to 206,000 in 250 societies and the turnover to £107,950,000, of which £25 million represented the sale of requirements.

On the marketing side, where very notable advances have occurred, all kinds of produce are handled—dairy produce, wool, eggs and poultry, meat, bacon and livestock, fruit and vegetables, potatoes and grain. Included under this head are the service societies—that is to say, hatcheries, A.I. and machinery pools. Perhaps the most surprising feature here is that over half the turnover under the heading of "Marketing" is accounted for by the sale of eggs and poultry. It is true that eggs and poultry, perhaps more than other produce, lend themselves to co-operation. Nevertheless, continued Sir Frederick, it is a substantial achievement to have reached a stage in which the producer societies are handling over one-third of the national home production of eggs.

Probably the most difficult field tackled is that of fruit and vegetables. A great deal of attention has been given to the development of marketing ideas for horticultural products, and in some places auction societies have rendered a very valuable service. There is scope here, suggested the speaker, for development along federal lines—that is to say, with independent societies linking up to supply produce to particular centres away from their immediate location. But so far, finance has been the main obstacle.

Sir Frederick continued: "There is, of course, a good deal of idealism underlying the principles of agricultural co-operation, and a lot of people are attracted to co-operation by these ideals. Unfortunately, what is in effect a business organization cannot be operated solely on ideals. I take the view that agricultural co-operation is a method of enabling farmers to help themselves. It can render immense services to the farming community. But it must be efficient, and no society has any right to exist unless it is in fact rendering a really useful service and giving the farmer a better service than he can obtain in other ways."

One of the main reasons why the turnover of organization operating under the agricultural co-operation banner has not increased even faster was, Sir Frederick suggested, the many difficulties which have beset all efforts at co-ordination under a central organization. But, he said, "At long last we have arrived at a satisfactory state where we have a single independent body responsible for the coordination of agricultural co-operative development in England, fully recognized and supported by the National Farmers' Union. There is every reason to believe, therefore, that great progress will be made; indeed, although the new body is not formally in existence, joint action between the agricultural co-operative movement and the Union has already been taken in certain directions which is of great advantage."

The Pig Progeny Testing Scheme The National Pig Progeny Testing Board has announced the broad details of its scheme of testing. Pedigree boars of any breed will be considered, and the full test of each boar will cover four litter groups of four pigs each (two gilts and two hogs), sired by the boar out of different dams (none of which is a full sister of any other). The dams must be pedigree sows or gilts of the same breed as the boar. No results will be supplied to the breeder until

the tests on all four groups are completed. Breeders will pay a testing fee of £5 for each group and will be paid a fair price per lb live weight for the pigs submitted.

To start with, the Board will test for bacon qualities, but it is expected that in due course pigs bred for pork and other purposes will be included. In deciding whether to select a boar for test, the Board will take account of the prolificacy of the female relatives (especially its dam), of the performance of relatives in tests conducted by the N.P.B.A. Progeny Testing Research Company Ltd. and British Oil and Cake Mills Ltd., and of any other evidence of carcass quality and growth rate.

Boars selected for test must come from herds which have at least ten breeding sows or gilts and are recorded under National Pig Records or any Scottish equivalent. Litter groups will not be accepted for testing unless they were taken from a litter that contained at least eight living pigs at the age of six weeks.

On arrival at the stations, litter groups must be not more than nine weeks old and must consist of pigs between 30 lb and 55 lb, with a difference of not more than 8 lb between the lightest and heaviest in the group. Every pig must have been vaccinated against swine fever and swine erysipelas at least three weeks before submission for testing. Tests will start on each pig as it reaches 60 lb live weight. The pigs will be sent to bacon factories when they reach 210 lb live weight. Measurement and assessment of the carcasses will be made by the Board's own carcass appraisal staff.

The Board proposes to use a system of modified *ad lib.* feeding. Pigs will be fed twice daily as much as they will eat in a fixed period (approximately 20 minutes). The ration will be made up as follows:

	Up to 130 lb Live Weight *per cent*	130-210 lb Live Weight *per cent*
Weatings	35	25
Barley meal	52	65
Whitefish meal	10	7
Lucerne meal (high quality)	3	3

Antibiotics and a stable source of vitamins A and D will also be included.

It is expected that the Board's first station at Selby, Yorkshire, will open early in 1957.

New F.A.O. Fellowships The Food and Agriculture Organization is to award a number of fellowships, to be known as André Mayer Fellowships, for advance training in close connection with research work in fields of particular interest to member countries and to F.A.O. as a whole. Only persons with the highest qualifications who have already shown a strong inclination and a real aptitude for research work, and who would be likely to benefit from additional training, will be selected.

Ten or twelve fellowships will be offered in 1957 and will spread over the whole field of F.A.O.—that is, agriculture, agricultural economics and statistics, fisheries, forestry, and nutrition. Awards will be for up to two years, with the possibility of an extension to a maximum of thirty months. Payment is expected to be $250 a month.

Further information about these fellowships can be obtained from the Secretariat of the F.A.O. National Committee for the United Kingdom, c/o Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S.W.1. The closing date for applications is January 31, 1957.

Soil Fertility Conference at Truro "If we're not maintaining fertility, we are not doing our job," said PROFESSOR H. G. SANDERS at a conference organized by the N.A.A.S. and Fertiliser Manufacturers' Association at Truro on November 1. Drainage, for example, is fundamental to fertility, but the record is not one to be proud of. We need to do as much again as we have done since 1940 to break the back of the problem. With lime, the picture is brighter. We ought to apply the equivalent of 7 million tons of chalk a year to make up for the drain on lime and catch up with the backlog. We achieved this for the first time in 1955 and look like doing even better this year.

Soil texture is very important. Tractors enable us to be timely with cultivations and thus help to produce the tilth which assists germination and holds the moisture in a dry spell. Next there is the humus content. Silt-type soils need a good organic matter content if they are not to pan. The two main sources of humus are muck and leys. Raynes has calculated that muck is worth £2-3 per ton on potatoes and £2 on sugar beet. Leys not only contribute organic matter when ploughed in, but their roots promote the desired crumb structure of the soil.

Once you have a basically fertile soil, then let it express itself through good applications of fertilizers. At present, we are only applying 75 per cent of the phosphate and potash which we ought to give, and well below the optimum quantities of nitrogen—especially on corn crops.

As for grassland, we should manure every acre—and do it every year. Larger doses at longer intervals are less satisfactory. Slag, complete fertilizers and nitrogen all have their part to play in good grassland management.

"Finally," said Professor Sanders, "fertility implies clean land." Well-thought-out rotations remain the secret of this. But now they can be backed by herbicides.

Another speaker, MR. D. S. LEWIS, produced some impressive statistics from forty costed farms. These had two-thirds of their acreage of grass in leys and maintained the basic fertility of their land by mucking, liming, and applying four times as much potash, and one and a half times as much phosphate to grass as the average farmer who has less than one-third of his grass in leys. They also used five times as much nitrogen on their grass as the average farmer.

Nor did these farms neglect the question of utilization. They strip-grazed their cows, controlled the grazing of dry cattle and sheep, and cut surplus grass early for silage rather than hay. Most of their summer milk production came from grass alone. And the forty farms quoted made 65 per cent more profit on the average than 280 dairy farms costed by the Provincial Agricultural Economics Service.

Mr. Lewis concluded that the effect of carrying more cows to the acre was twice as important as the effect of increasing the milk yield of each cow. And in case it was thought that adoption of the methods of these farms would cause over-production and depress the pool price of milk, he pointed out that intensive grassland management was no less important for a breeding ewe flock, which had in fact been introduced on a number of the farms examined.

M. Reeves

IN BRIEF

Heat and the Colour of Milk

The colour of milk is usually taken for granted, and it is only when processing causes serious colour changes, as in sterilization, that it becomes of much importance. Mr. H. Burton, of the National Institute for Research in Dairying, read a paper on this subject recently to the Society of Dairy Technology, which is reproduced in the Society's Journal for October.

The browning of milk during sterilization is of practical interest since it limits the amount of heat treatment which can be given during an in-bottle sterilization process. It is brought about by a reaction between the lactose and the protein of the milk, in the presence of water. The precise nature of the reaction is little understood, but it is known to be complex. Browning only becomes marked at temperatures above about 90°C., and the amount of browning is dependent, as with other chemical reactions, on the time and temperature for which the milk has been held. The rate of browning increases about three times for each 10°C. rise in temperature. The acidity of the milk also influences the rate of browning, increased acidity decreasing the amount of browning. There is therefore no danger from the browning point of view in processing slightly acid milk. On the other hand, milk which has become contaminated with alkali will become very brown on heat treatment. Among the naturally-occurring variations in milk composition, the only factor which seems to influence the rate of browning is the pH of the milk: variations in composition seem to be important only in so far as they are related to the natural pH.

Phosphine as a Fertilizer

The possibilities of using phosphine as a fertilizer are being investigated at King's College, University of Durham. Phosphine has many obvious disadvantages; but it is more than ten times as concentrated as superphosphate, our standard arable phosphatic fertilizer. Commercial handling may not, in any case, present any more serious problems than did some of the modern phosphorus insecticides.

A preliminary glasshouse experiment on radishes and wheat showed that phosphine was not toxic to germination or growth at normal dressings, and only at a rate equivalent to 18 cwt per acre of superphosphate was some leaf discoloration noticed. Soil retention of the compound was nothing like so efficient as with ammonia; but at all normal dressings no loss to the atmosphere should be experienced.

In another glasshouse experiment with radishes, where superphosphate was applied at 0, 1½ and 3 cwt per acre and phosphine at the same levels of phosphorus, there was no significant difference in the response of either total fresh matter or dry matter between the two sources of phosphorus. At the higher levels, however, the uptake of phosphorus from phosphine was almost double that from superphosphate. This suggests that soil fixation may be lower with phosphine than with superphosphate.

Embroilment

A certain aura of ambiguity surrounds the word "broilers", which is designed to describe small young chickens for grilling or roasting. No one

appears to like it, but all attempts to find a reasonable and more descriptive alternative have so far been unproductive. The gastronomic significance of broiling belongs to an earlier age, when the gridiron was a commonplace of the kitchen. Chaucer knew of it when he wrote: "He cowde roste, sethe, broille and frie" and, according to legend, St. Lawrence had good cause to remember it. But although we wish our modern neologists success in their search for the *mot juste*, the answer may well be to rescue the verb "to broil" from its present obscurity and ensure that, by publicity, every housewife includes it in her vocabulary. If not that, why not just "young chicken" and leave the culinary completion to a housewife's choice? By any name the meat would taste as sweet.

Pointers in Tractor Fuel Economy

Make sure that the tractor is always working as economically as possible. It needs a certain amount of fuel to take it along, to overcome the rolling resistance of the wheels, and so it pays to do as much work as possible in each bout that the tractor travels. Surveys show that most tractors are operated at full load for only about a third of their time, but even on a light load fuel consumption need not be too high. Expert re-tuning of the carburettor on a petrol or vaporizing oil engine can sometimes improve running. Whether any changes in setting have been made or not, see that the proportion of fuel and air given by the carburettor is not upset by other factors—for example, a blocked air cleaner. Also, damage to the float chamber mechanism can make the mixture too rich by allowing the fuel to stand too high in the jet. It can even cause the carburettor to flood continuously.

Keep the ignition system in good order and the spark timing as far advanced as possible.

Diesel engines are not amenable to tuning in the same way as spark ignition engines, and nothing can be done comparable with adjusting the strength of mixture in a petrol or paraffin engine.

Diesel fuel should be kept clean, so that the engine will run without spluttering and without stoppages; also that no fuel will have to be thrown away because it is too dirty to use. All engines, whether diesel or spark, should be kept at the correct working temperature.

Finally, keep tyre pressures correct, so that both rolling resistance and wheel spin are minimized. In general, low tyre pressures increase rolling resistance; very high pressures may increase slip.

Work at Weybridge

The Central Veterinary Laboratory of the Ministry of Agriculture at Weybridge, to which a new building of outstanding functional design was added in October, produces annually approximately one million doses each of Strain 19 anti-abortion vaccine and swine fever crystal violet vaccine, and well over 40 million doses of tuberculin. On the diagnostic side, nearly 200,000 specimens were received in 1955. There are some 240 acres of land attached to the Laboratory, on which stock is maintained, experiments carried out, and fodder crops grown. At the present time, there are over 1,500 cattle, sheep and pigs housed and kept at Weybridge, as well as some 7,500 fowls, turkeys, guinea pigs, rabbits and mice.

Early Calf Weaning

Experiments at the Rowett Research Institute on the weaning of calves at three weeks continue to attract attention. Whole milk is fed for only three weeks before replacement by a gradually increasing ration of meal, hay and water. Colostrum is, of course, given for the first three days, and then milk at the rate of 8 per cent of the birth weight, the daily allowance being divided equally between two feeds. Hay and water are put before the calf at a week old.

Bucket feeding of the meal mixture is offered at fourteen days, and the amount increased until the calf is taking 4-6 lb a day, according to a steady weight gain. All milk feeding is finished at three weeks. At 12 weeks old, the initial weaning ration is replaced by a mixture of 85 per cent cereals, 15 per cent groundnut meal and a mineral supplement.

An account of the preliminary experiments at Rowett by Dr. T. R. Preston was published in the January 1956 issue of *Agriculture*.

The Secret of the Dewpond

Mr. Claude Brighten, writing in the November issue of the *Journal of the Land Agents' Society*, passes on the secret of making dewponds, as given to him some years ago by a Hampshire man whose family had been traditionally associated with their construction. His advice was to dig out and shape to a size estimated according to the head of stock to be served. Cover the floor and sides up to the lip of the basin with 6 inches of clay, which should be heavily puddled. Cover with 3 inches of lime and then a good coating of straw. This latter is to keep the stones or natural soil from sinking into the lime and damaging the clay puddle. Then finish off with 12 inches of natural soil. A dewpond so made will last thirty years, or until the lime has deteriorated.

A clay puddling mallet should be made with a round and tapered head of elm, the base being 6 inches and the top 3 inches in diameter. The top and bottom lips are edged with ½ inch galvanized hoop iron. The mallet can be 12 or 18 inches tall, according to requirements. At a point one-third the distance from the base an ash handle is inserted at an angle of 35 degrees to the horizontal. For a 12-inch mallet the handle should be 33 inches and for an 18-inch mallet 42 inches long. No metal shoe is needed.

Fence the pond with a wooden post and two rail fences to keep out cattle and horses, but the bottom rail should be high enough to allow sheep to get underneath. For watering horses and cattle, a pitcher pump should be installed to draw water into a drinking trough outside the fence.

Grass Silage for Breeding Bulls

Experimental evidence from Canada indicates that, contrary to opinion in some quarters, the feeding of large amounts of grass silage to dairy bulls does not result in paunchiness and slowness at service. At the Central Experimental Farm in Ottawa breeding bulls have been given a high percentage of grass silage in their roughage ration over a period of 52 weeks. Feeding the silage at the rate of 4 lb per 100 lb of body weight daily, showed no harmful effect on the physical condition of the bulls or on the quality or quantity of semen produced.

BOOK REVIEWS

Competitive Farming. M. McG. Cooper. Crosby Lockwood. 10*s.* 6*d.*

The reputation which Professor Cooper has for not pulling his punches is well maintained in this book! His advocacy of ley farming and forage feeding is now well known and is a proposition to which he returns again and again in these pages. He argues cleverly and lucidly that its widespread adoption on British farms could lead to a substantial reduction in feeding costs and to an expansion of output which would help to spread overhead costs. In the process, the recent tendency to use more purchased concentrates in our dairy herds comes in for some heavy criticism, especially as many farmers have mistakenly gone for higher yields per cow with the aid of concentrates, rather than " maximum mouths to the acre " based on better grassland: it is profit per acre and not profit per cow that matters. It is true that the feeding of bulky foods is more laborious, but the buck-rake and the electric fence have revolutionized the economics of grassland and taken much of the sting out of the drudgery involved.

Not everyone will agree with the author's assessment of the future prospects for imported meat, but few will deny his contention that there is scope for increased supplies at home. More lambs from the hills and from subsidiary enterprises on lowland farms are possibilities with better grassland management, but many farmers will disagree with the case made for the production of early lamb, in view of the recent, relatively small price differential between early and late marketings. But there are also some poignant remarks on some of the expensive schemes of hill land reclamation, and the argument for gradual improvement rather than the more grandiose plans is well founded. The hope for more beef is said to lie in our dairy herds; if we can lengthen the productive life of the dairy cow, fewer replacements will be required and thus land will be released for beef production. But can we accept that the individual farmer will use this land for cross-bred beef stores rather than for increasing the size of his dairy herd, relative prices for meat and milk being what they are?

There is much more in this book than an exposition of the merits of ley farming and of how to get more meat. There is a stinging chapter on our methods of pedigree breeding and recording which will infuriate the traditionalists but will delight many others with its good sense. There is also a critical analysis of our methods of agricultural research and teaching and of our advisory work, where a strong case is made for the divorce of the advisory service from administrative duties. Less well treated are questions of land tenure, and of size and layout of farms, which many would regard as of fundamental importance to the future competitive position of the industry. The provision, on the New Zealand pattern, of farms by the State for young, well-qualified aspirants to farming is advocated, but the necessary increase in the size of farms by the amalgamation of holdings should, the author thinks, be left to the free play of economic forces. Not everyone will agree wtih Professor Cooper's arguments, but all will find this a provocative and stimulating book, with wide coverage and close argument.

W.J.T.

A Partridge Year. Esmond Lynn-Allen and A. W. P. Robertson. Geoffrey Bles. 12*s.* 6*d.*

This is a good book; written in a homely and pleasing style, full of sound natural history and evidence of keen and careful observation. Its subject, as the authors so rightly say, is one of the most likeable birds we have. Probably there is no better or braver bird parent than the partridge, and I have an old but still vivid recollection of a hen partridge successfully repelling the attack of a stoat which had designs on the bird's young brood.

In the foreword the authors seem inclined to lament the relative lack of interest taken in the partridge by " scientific ornithologists ", but neither they nor their subject are the worse for that.

The best things in the book are the chapters on the breeding habits of the partridge, which contain what is probably the fullest information on this phase of the partridge's life that has so far been published.

He would be a bold critic, whether naturalist or sportsman, who would challenge any statement by authors so obviously qualified for their job, but I should have liked some evidence for the suggestion (to be fair, it is no more than that) that the partridge has an effective sense of smell. It may well be true, but it has not, as far as I know, yet been demonstrated.

The photographs are first class. All were taken by Alec Robertson, one of the co-authors of the book, whose tragic death before the book was published will be regretted by many who knew him and his writings, and liked both.

Here is very good value for money—better value, indeed, than many more pretentious and widely publicized works of its kind.

F.H.L.

On the Road to Pastures New. MAURICE MOYAL. Phoenix House. 21*s*.

This is a most interesting and refreshingly unusual book. M. Moyal, a travel-writer of experience and boldness, recently had the notion of joining up with an age-old nomadic agricultural migration of a kind one could scarcely believe still occurs in a modern civilized country, with the aim of describing it to the incredulous world in a book.

Down in the far south-eastern corner of France, on the sea-level, sun-parched grazings of La Crau, sheep-farmer Jean Chemin must each year move his 2,300-strong flock of sheep and goats over 200 miles to the lush Mercantour Range of the Alps, where 8,000 feet up they can enjoy the grazing that the fast-approaching droughts of their homeland would make impossible. Each summer this trek is made, as it has been made for some ten centuries past, against all odds, in a primeval yet somehow vastly satisfying encounter with wild nature. The farmer must restrain the instinctive *wanderlust* of his flock, even though their ribs show through their shorn sides and their tongues discover only hot pebbles, until he hears that the thaw in the Alps has begun. Then, with his sturdy, barrel-chested chief shepherd and his hired men, Chemin sets off, driving his beasts slowly, painfully, but inexorably in thirteen traditionally-divided marches of about fifteen miles each. The young stock set the pace, with the named bell-bearers set at strategic points in the great platoon, and accompanied by a mare-drawn wagon and a rearguard of tough donkeys, they take the less-frequented tracks and travel mainly at night to avoid both the heat and the traffic.

This book describes the amazing journey in all its terror and splendour, ending with the triumphant arrival of the battered but acclimatized flocks in the land of delectable grass, where they remain until October. The author writes vividly and feelingly in the crisp, intense style of a documentary film commentary—indeed his book reminded me of that silent epic on an identical theme, *Grass*. His text is helped by some excellent photographs taken by his companion on the march. Anyone who cares for sheep in general, not necessarily only these gallant Arles Merinos, will be both moved and taught by this book.

D.G.

Complete Poultry Keeper and Farmer (Revised Edition). LESLIE PEARCE-GERVIS. Cassell. 21*s*.

The revised edition of the *Complete Poultry Keeper and Farmer*, which was first published in 1938, is welcomed as being of no small interest to the newcomer to the industry. There are, however, a number of statements remaining in this revision which are outdated and only of historical interest, such as the cramming and surgical caponization of poultry. To my mind, the new generation of poultry-keepers hardly needs to know this kind of thing. On the other hand, there is a great deal of up-to-date information, generally known to most poultry-keepers, which is not in the book at all. In particular, the new techniques of breeding by progeny testing, and the use of reciprocal recurrent selection as a mass method of improving egg production levels should have been mentioned.

The biggest criticism I have to make is of the advice, given in the chapter on diseases, to use Epsom salts for coccidiosis and copper sulphate for controlling intestinal worms. This is dangerously misleading in these times when there are much more satisfactory preparations available.

The chapter on incubation will be of particular help to the beginner, although the inclusion of the elementary principles of incubation involving the development of the embryo would have been useful in making exactly what does happen clearer to the uninitiated.

The layout of the book is excellent; it is easy to follow and, provided any beginner who may read it realizes that there are important scientific developments left out, it should be of considerable benefit to him.

H.R.F.

BOOK REVIEWS

Daniel Hall: Pioneer in Scientific Agriculture. H. E. DALE. John Murray. 21*s.*

Sir Daniel Hall played a very prominent part in the remarkable development of agricultural education and research that began in this country in the early 1890s and has expanded steadily to its present vast dimensions. His educational policy and courses at Wye College, which he started in 1894, have been widely adopted elsewhere; more than anyone else, he was the architect of our present organization of agricultural research. Few men have greater claims for remembrance by those interested in agriculture, and the late H. E. Dale, his friend and for long his colleague, has rendered valuable service by writing his life.

The account extends over nearly eighty years—from 1864 to 1942, a period of almost incredible change, out of which Mr. Dale has made a story of enthralling interest. It begins in Rochdale in the mid-nineteenth century, where a group of working men, thrown on their own resources for relaxation, developed a keen interest in natural history, flower and vegetable growing, and the breeding of small animals; and Hall, the son of a small flannel manufacturer there, was so attracted by all this that he was admitted to a little coterie of the best of them and so began to acquire those habits of careful observation that were invaluable to him later on. After four years at the Manchester Grammar School he gained a Brackenbury Scholarship at Balliol College, Oxford, where he studied chemistry, was stroke in the College boat, and developed the sensitive taste for beautiful things and for the graces of life that gave so much charm to his later years, and saved him from the narrowness of outlook and the dullness that sometimes afflicts the high specialist.

Mr. Dale describes Hall's achievements at Wye and at Rothamsted and then deals at length with the fruitful years at the Development Commission and the more difficult time at the Board of Agriculture, as it then was. This section will be invaluable to the historian: no one had more authoritative information than Mr. Dale and it is all set out fearlessly, giving a vivid picture of the Government machine as it then operated. The fascinating story of the origin of Government support for agricultural education and for research is told at length: both subjects slipped in as it were by a back door, and either might easily have had to wait much longer for recognition.

Mr. Dale had a good subject to deal with and he has acquitted himself well. The book is of special importance to the growing number of those interested in agricultural history, and it deserves a place on the shelves of all serious agricultural students, for no one can fully appreciate his subject without some knowledge of the pioneers who laid its foundation. We wish the book all success.

E.J.R.

John Innes Horticultural Institution Annual Report, 1955. 3*s.*

The John Innes report is one of the most modest of research station "annuals" in so far as size goes, but it covers, briefly, a wide range of experimental work—some of immediate usefulness and some portraying the shape of things to come.

In the breeding work, an intensive attack is to be made on the urgent problem of resistance to scab and mildew in apple; there is promise of new strawberries to help in the fight to fill the gap left by the eclipse of Climax, and the self-compatible sweet cherries have reached the fruiting stage and selections of trees with good-quality fruit are being made for further trial.

The now familiar glasshouse work makes a contribution to the controversy of high-level versus low-level heating pipes, from which it is concluded that they are equally effective in heating the lower air and soil surface, but temperatures are higher close to low-level pipes, which at times is advantageous. Electrical bench warming with low air temperatures has been advocated in some quarters for plant propagation, but is only worth while if the cost is distinctly lower than for normal air warming. Despite practical belief to the contrary, it is concluded that little can be done to maintain high humidity in glasshouses under really sunny conditions, and that increasing humidity does not influence "dry set" of tomatoes, whereas tapping the plant does. Lastly, the use of the new acid J.I. compost for Ericas has been successfully extended to some other calcifuge plants.

Altogether, it is a record of progress to be proud of, but this is something we have come to expect of the John Innes Institution.

The report is obtainable from the John Innes Horticultural Institution, Bayfordbury, Hertford.

R.T.P.

Guide to the National Pinetum and Forest Plots at Bedgebury (2nd Edition). H.M. Stationery Office. 3*s.* 6*d.* (3*s.* 8*d.* by post).

The appearance of a second edition of the guide to Bedgebury, only four years after the publication of the first, is sufficient testimony to its popularity and to the increasing public interest in the National Pinetum and Forest Plots.

In his foreword, Sir Geoffrey Evans gives some historical data, but the part played by William Dallimore, V.M.H., the chief architect, in the foundation of the National Pinetum is perhaps insufficiently stressed. Without Dallimore's sustained effort and enthusiasm, the venture might well have failed; at 85 years of age, he maintains his interest and regularly visits Bedgebury from his home near Tunbridge Wells.

To the guide itself, Dallimore has contributed an account of the Pinetum; the similar account of the Forest Plots is by R. F. Wood and A. W. Westall. The remainder of the guide is anonymous and includes a brief, general description of the locality—topography, geology and soils—and of the more extensive Bedgebury Forest in which the Pinetum and Forest Plots are included. There is a list of the conifers grown and of the species in the Forest Plots; between three and four hundred species, varieties and hybrids are included under their botanical and vernacular names. The country of origin is given for each. Of particular interest to foresters is the abstract of data from a sample plot, and a selected list of growth records. Some meteorological facts, showing especially the extreme conditions experienced between 1934 and 1948, will interest both foresters and horticulturists.

The guide is illustrated by ten photographs, some of which have suffered in reproduction; the end papers have plans (scale about 1:3,500) of the Pinetum and Forest Plots; there is a small sketch-map showing the approaches, and an appendix gives general information for prospective visitors. Fishing is permitted in the lake, at an annual charge of 5*s.*

The guide is well printed in the style familiar to all the similar guides issued by the Forestry Commission, but one serious omission is an account of the wild flora and fauna.

A.A.B.

The Archers Intervene. GEOFFREY WEBB and EDWARD J. MASON. Heinemann. 10*s.* 6*d.*

With their genius for "neighbourliness", these indefatigable script-writers have, in their second short novel, evoked the richer purposes of life from a plain tale, simply told in some two hundred pages. They succeed, as they do in the most famous of B.B.C. serials, in convincing their audience that the Ambridge folk really exist and that there is no human problem which cannot be solved by the unobtrusive qualities of kindliness, simplicity and understanding. This is a good book for Christmastide, a book which tells of human frailties, of goodwill and final content. Archer addicts will find most of their old friends—and some new ones—embroiled in a drama of rural grief and joy. They will also find that reading the book is like a day out at the agricultural show, a chance to watch relatives and friends ride, an opportunity to gossip with acquaintances from nearby villages, to nod wisely about the last harvest and to wonder about the weather. Indeed, it is this intermingling of friends and families that gives the book its charm.

Harry Lane is determined that his daughter, Barbara, shall be a champion horsewoman. To buy better horses for her, he neglects his farm and his wife. When inquiries are made about payments on a muck-spreader he has "sold" to Dan Archer, Harry is in a tight spot. So is Barbara Lane, in love with Jimmy, whose firm owns the muck-spreader. But the Archers intervene, bringing sympathy and advice to a harassed Mrs. Lane, and a firm but helping hand to her husband. And, of course, the older folk have plenty to do in smoothing the path of the youngsters' love affairs.

The fortunes of the Lane family and of their neighbours, the Archers, will be followed as eagerly as though the characters are relatives and friends of those for whose entertainment they have been created.

E.St.J.H.

Bark. (Open Air Guides). DR. ALFRED SCHWANKL (Translated by H. L. EDLIN). Thames and Hudson. 12*s.* 6*d.*

Bark is a subject about which most of us know all too little, and this very pleasing little book is especially welcome because until now there has been virtually no popular literature on this aspect of tree identification. I am sure that many of the landowners,

farmers, and smallholders who read the book will find that it gives them new interest in the trees of their spinneys, shelter-belts and hedgerows.

Dr. Schwankl not only teaches us how to tell one tree from another by its bark, but also how to diagnose various faults and diseases in trees by studying the irregularities in their bark pattern. He also explains the formation and growth of bark and the reasons for its variation according to age.

It is indeed a joy to find, so reasonably priced, a book so lavishly illustrated, and my only criticism of the very good collection of photographs is that a few have been trimmed so severely, no doubt to economize in space, that their beauty has been marred. Perhaps it should be mentioned that to British Foresters the swollen base of the old Scots pine, illustrated on page 30, is more indicative of probable butt rot than is the extra-thick bark mentioned in the caption.

Mr. Edlin is to be congratulated on his good work in translating and editing this excellent handbook.

M.N.

Farmer and Stock-Breeder Year Book and Desk Diary, 1957. Farmer and Stock-Breeder. 12*s.* 6*d.*

Once again the *Farmer and Stock-Breeder* have produced a most attractive and valuable publication which will solve many a problem in many farming families. All the familiar features are there. In the Diary Section there are the Field Records (now much improved in lay-out), the Farm Accounts, and the diary itself with the same excellent design as last year but with some additional new daily reminders by Professor Ian Moore. Only one small item is now lacking—a Farm Management Section, with tables for the various efficiency factors.

The "Pedigree Peerage", with its 47 pages of fine pictures, leads to the Reference Section, a rich mine of information. These 186 pages of small type contain a wonderful collection of facts and figures—from the litter absorption rate of dead leaves to the rates of sur-tax. One cannot fail to be impressed by the sheer magnitude of the task of collecting together so much information into one place. The saving in time and trouble from having such a reference book at one's elbow must be so great that one wonders how any farmers at all get on without it.

This year the book has been given a new look. It now has a substantial stiff cover, and a cloth binding has replaced the ring spine which may have been functionally useful but detracted from the appearance of the book.

As an aid in the business of farming, this book is invaluable. Well designed, well produced, and so packed with interesting information, it is a pleasure to read and will assuredly be a good companion throughout the farming year.

B.E.C.

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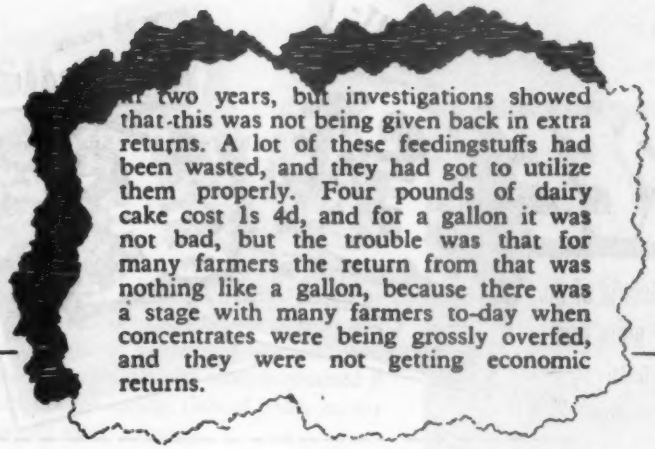
two years, but investigations showed that this was not being given back in extra returns. A lot of these feedingstuffs had been wasted, and they had got to utilize them properly. Four pounds of dairy cake cost 1s 4d, and for a gallon it was not bad, but the trouble was that for many farmers the return from that was nothing like a gallon, because there was a stage with many farmers to-day when concentrates were being grossly overfed, and they were not getting economic returns.

Mr. R. Kenney, Principal & County Education Officer, Dorset Farm Institute
(Farmer & Stockbreeder, 16th October)

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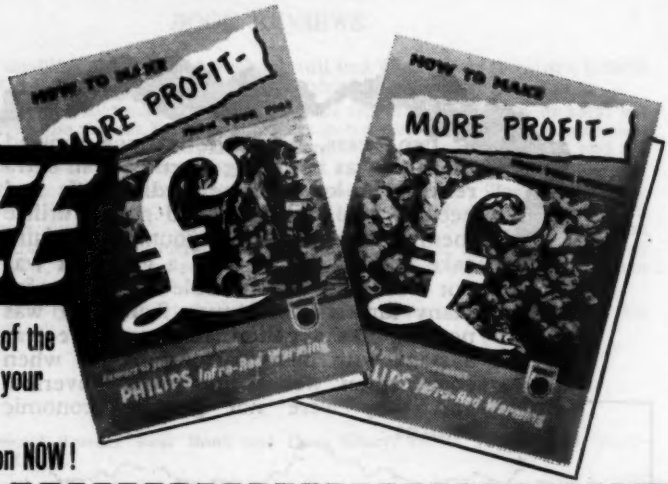

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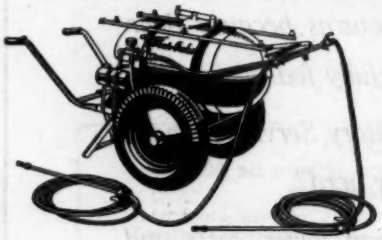

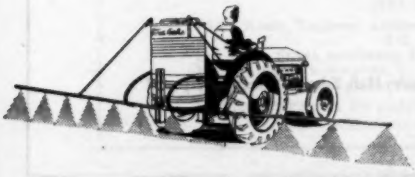

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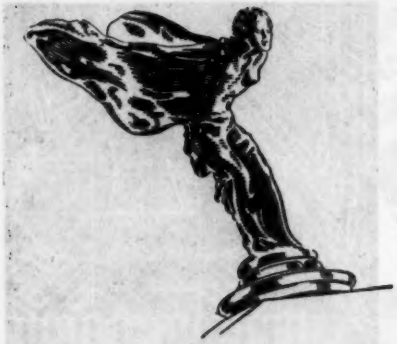

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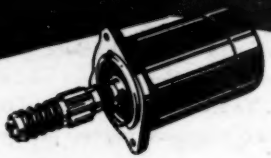

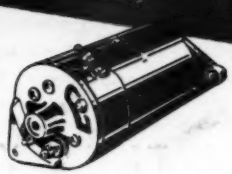

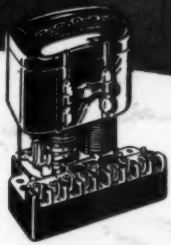

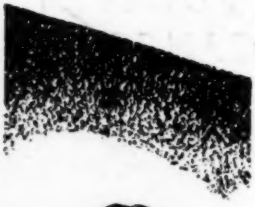

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